MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

**B. Tech – Civil Engineering**
**Course Structure (R22)**
**Applicable From 2022-23 Admitted Batch**
**Structure Breakup**

| S.No | Category | Breakup of credits (Total 160 credits) |
|---|---|---|
| 1 | Humanities and Social Sciences including Management courses (HSMC) | 10 |
| 2 | Basic Sciences Courses (BS) | 20 |
| 3 | Engineering Sciences courses including Workshop, Drawing basics of electrical/mechanical/computer etc.(ES) | 21 |
| 4 | Professional Core courses (PC) | 63 |
| 5 | Professional Electives (PE) | 18 |
| 6 | Open Electives (OE) | 9 |
| 7 | Project work, Seminar and Internship in industry or elsewhere (PS) | 19 |
| 8 | Mandatory Courses | - |
| | **TOTAL** | **160** |

**I YEAR I SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2210001 | Matrix Algebra and Calculus | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 2210008 | Applied Physics | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | 2210501 | Programming for Problem Solving | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 2210372 | Engineering Workshop | ES | 0 | 1 | 3 | 2.5 | 40 | 60 | 100 |
| 5 | 2210010 | English for Skill Enhancement | HS | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2210175 | Elements of Civil Engineering | PC | 0 | 0 | 2 | 1 | 50 | - | 50 |
| 7 | 2210071 | Applied Physics Laboratory | BS | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| 8 | 2210571 | Programming for Problem Solving Laboratory | ES | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 9 | 2210073 | English Language and Communication Skills Laboratory | HS | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | **Mandatory Course** | | | | | | | | |
| 10 | 2210021 | Environmental Science | MC | 3 | 0 | 0 | 0 | - | - | - |
| | - | Induction Programme | - | - | - | - | - | - | - | - |
| **Total Credits** | | | | **14** | **3** | **12** | **20** | **370** | **480** | **850** |

**I YEAR II SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2220002 | Differential Equations and Vector Calculus | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 2220009 | Engineering Chemistry | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | 2220371 | Engineering Drawing Practice | PC | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 4 | 2220122 | Applied Mechanics | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 2220123 | Surveying | PC | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2220572 | Data Structures Laboratory | ES | 0 | 1 | 2 | 2 | 40 | 60 | 100 |
| 7 | 2220072 | Engineering Chemistry Laboratory | BS | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | 2220176 | Surveying Laboratory - I | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| **Total Credits** | | | | **12** | **3** | **10** | **20** | **320** | **480** | **800** |

**II YEAR I SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2230124 | Building Materials, Construction and Planning | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 2230125 | Strength of Materials – I (Syllabus modified) | PC | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | 2230126 | Fluid Mechanics | PC | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 4 | 2230016 | Business Economics and Financial Analysis | HSMC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | 2230202 | Basic Electrical and Electronics Engineering | ES | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2230177 | Surveying Laboratory - II | PC | 0 | 1 | 2 | 2 | 40 | 60 | 100 |
| 7 | 2230178 | Strength of Materials Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | 2230272 | Basic Electrical and Electronics Engineering Laboratory | ES | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | **Mandatory Course** | | | | | | | | |
| 9 | 2230023 | Constitution of India | MC | 3 | 0 | 0 | 0 | - | - | - |
| **Total Credits** | | | | **17** | **3** | **6** | **20** | **320** | **480** | **800** |

**II YEAR II SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2240127 | Engineering Geology | PC | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 2 | 2240128 | Strength of Materials – II (Syllabus changed) | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 2240129 | Hydraulics and Hydraulic Machinery | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 2240006 | Probability and Statistics | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 5 | 2240503 | Python Programming | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2240179 | Fluid Mechanics and Hydraulics Machinery Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 7 | 2230180 | Computer Aided Drafting Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | 2240573 | Python Programming Laboratory | ES | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | **Project** | | | | | | | | |
| 9 | 2240191 | Field based Project | PS | 0 | 0 | 4 | 2 | 50 | - | 50 |
| | | **Mandatory Course** | | | | | | | | |
| 10 | 2240022 | Gender sensitization | MC | 3 | 0 | 0 | 0 | - | - | - |
| **Total Credits** | | | | **17** | **1** | **10** | **20** | **370** | **480** | **850** |

**III YEAR I SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2250130 | Water Resources Engineering | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 2250131 | Basic Structural Analysis | PC | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | 2250132 | Design of Reinforced Concrete Elements | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | - | Professional Elective - I | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | - | Open Elective – I | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2250181 | Concrete Technology Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 7 | 2250182 | Computer Aided Design and Detailing Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | 2250183 | Design and Drawing of Irrigation Structures | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | **Internship *** | | | | | | | | |
| 9 | 2250192 | Internship * | PS | 0 | 0 | 0 | 1 | - | 100 | 100 |
| **Total Credits** | | | | **15** | **1** | **6** | **20** | **320** | **580** | **900** |

**III YEAR II SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2260133 | Design of Steel Structures | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 2260134 | Soil Mechanics | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 2260017 | Fundamentals of Management | HSMC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | - | Professional Elective – II | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | - | Open Elective – II | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2260011 | Advanced English Communication Skills Laboratory | HSMC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 7 | 2260184 | Soil Mechanics Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 8 | 2260185 | Civil Engineering Software Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | **Project** | | | | | | | | |
| 9 | 2260193 | Industrial Oriented Mini Project | PS | 0 | 0 | 4 | 2 | - | 100 | 100 |
| | | **Mandatory Course** | | | | | | | | |
| 10 | 2260024 | Intellectual Property Rights | MC | 0 | 2 | 0 | 0 | - | - | - |

| Total Credits | 15 | 2 | 10 | 20 | 320 | 580 | 900 |
|---|---|---|---|---|---|---|---|

*Students have to undergo internship in semester break after 2nd year 2nd semester and evaluation is carried out in 3rd year 1st semester.

**IV YEAR I SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| | | **Theory** | | | | | | | | |
| 1 | 2270135 | Environmental Engineering | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | 2270136 | Estimation, Costing and Project Management | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 2270137 | Transportation Engineering | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | - | Professional Elective – III | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | - | Open Elective – III | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | **Laboratory** | | | | | | | | |
| 6 | 2270186 | Environmental Engineering Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 7 | 2270187 | Transportation Engineering Laboratory | PC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | **Project** | | | | | | | | |
| 8 | 2270194 | Project Stage – I | PS | 0 | 0 | 6 | 3 | 100 | - | 100 |
| **Total Credits** | | | | **15** | **0** | **10** | **20** | **380** | **420** | **800** |

**IV YEAR II SEMESTER**

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal (CIE) | External (SEE) | Total |
| 1 | - | Professional Elective - IV | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | - | Professional Elective - V | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | - | Professional Elective - VI | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | **Project** | | | | | | | | |
| 4 | 2280195 | Technical Seminar | PS | 0 | 0 | 4 | 2 | 100 | - | 100 |
| 5 | 2280196 | Project Stage – II | PS | 0 | 0 | 18 | 9 | 40 | 60 | 100 |
| **Total Credits** | | | | **9** | **0** | **22** | **20** | **260** | **240** | **500** |

**PE I - Professional Elective I**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2250141 | Concrete Technology |
| 2 | 2250142 | Structural Dynamics and Earthquake Engineering |
| 3 | 2250143 | Pre-Fabricated structures |
| 4 | 2250144 | Introduction to Offshore Structures |

**PE II - Professional Elective II**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2260145 | Indeterminate Structural Analysis |
| 2 | 2260146 | Prestressed concrete |
| 3 | 2260147 | Advanced Structural Design |
| 4 | 2260148 | Introduction to Finite Element Methods |

**PE III – Professional Elective III**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2270149 | Ground Water Hydrology |
| 2 | 2270150 | Design of Hydraulic Structures |
| 3 | 2270151 | Water Shed Management |
| 4 | 2270152 | Water Supply Network |

**PE IV - Professional Elective IV**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2280153 | Railway, Airport and Harbour Engineering |
| 2 | 2280154 | Bridge Engineering |
| 3 | 2280155 | Traffic Engineering |
| 4 | 2280156 | Pavement Analysis and Design |

**PE V - Professional Elective V**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2280157 | Hydrology & Water ResourcesEngineering |
| 2 | 2280158 | Industrial Waste water Treatment |
| 3 | 2280159 | Waste Management |
| 4 | 2280160 | Environmental Impact Assessment |

**PE VI - Professional Elective VI**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2280161 | Foundation Engineering |
| 2 | 2280162 | Ground Improvement Techniques |
| 3 | 2280163 | Repair and Rehabilitation of Structures |
| 4 | 2280164 | Remote Sensing and GIS |

**Open Electives**

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | 2250101 | Air and Noise Pollution Control |
| 2 | 2260102 | Remote Sensing and GIS |
| 3 | 2270103 | Disaster Management |

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# I-I

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## 2210001: MATRIX ALGEBRA AND CALCULUS (Common to all)

**B.Tech. I Year- I Semester** **L T P C**
**3 1 0 4**

**Pre-requisites:** Mathematical Knowledge at pre-university level

**Course Objectives:** To learn

- Types of matrices and their properties, concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems. Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative and Finding maxima and minima of function of two and three variables
- Evaluation of multiple integrals and their applications

Course outcomes: **After learning the contents of this paper the student must be able to**

CO1: **Write the matrix representation of a set of linear equations and to analyses the solution of the System of equations.**

**CO2:** Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.

**CO3:** Solve the applications on the mean value theorems, and evaluate the improper integrals using Beta and Gamma functions.

**CO4:** Find the extreme values of functions of two variables with/ without constraints.

**CO5:** Evaluate the multiple integrals and apply the concept to find areas, volumes.

**UNIT-I: Matrices** **10 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method**.**

**UNIT-II: Eigen values and Eigen vectors** **10 L**

Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

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**UNIT-III: Calculus 10 L**

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series (without proofs). Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) 10 L**

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence-independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**UNIT-V: Multivariable Calculus (Integration) 8 L**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and triple integrals (Cartesian to Spherical and Cylindrical polar coordinates).Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5thEditon,2016.

**REFERENCE BOOKS:**

1. Erwin kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons,2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, NewDelhi.

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## 2210008: APPLIED PHYSICS

**B.Tech. I Year-I Semester** **L T P C**
**3 1 0 4**

**Prerequisites:** 10 + 2 Physics

**Course Objectives:** The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nano scale, quantum confinement and various fabrications techniques.
   Study the characteristics of lasers and optical fibres.

**Course Outcomes:** At the end of the course the student will be able to:

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nano materials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

### UNIT - I: QUANTUM PHYSICS AND SOLIDS

**Quantum Mechanics:** Introduction to quantum physics, Blackbody radiation, Photoelectric effect, de-Broglie Hypothesis, Matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Time independent Schrodinger's wave equation, Particle in one dimensional potential box.

**Solids:** Free electron theory (Drude & Lorentz, Sommerfeld) (qualitative), Bloch's theorem -Kronig-Penney model, Effective mass of an electron, Origin of energy bands, Classification of solids.

### UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and Extrinsic semiconductors, Hall effect, Direct and Indirect band gap semiconductors, Construction, Principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT) - LED, PIN diode, Avalanche photo diode (APD) and solar cells, their structure, Materials, Working principle and characteristics.

### UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

**Dielectric Materials:** Basic definitions, Types of polarizations (qualitative), Ferroelectric, Piezoelectric, and Pyroelectric materials, Applications.

**Magnetic Materials:** Domain theory of ferromagnetism, Soft and Hard magnetic materials, Magnetostriction, Magnetoresistance, Applications.

**Energy Materials:** Conductivity of liquid and solid electrolytes, Superionic conductors, Materials and electrolytes for super capacitors.

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## UNIT - IV: NANOTECHNOLOGY

Nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up fabrication: Sol-gel, precipitation methods, Top-down fabrication: Ball milling, Physical vapor deposition (PVD), Characterization techniques: XRD, SEM and TEM, Applications of nano materials.

## UNIT - V: LASER AND FIBER OPTICS

**Lasers:** Laser beam characteristics, Three quantum processes, Einstein coefficients and their relations, Lasing action, Population inversion, Pumping methods, Ruby laser, He-Ne laser, Nd:YAG laser, Applications of laser.

**Fiber Optics:** Introduction to optical fibers, Total internal reflection, Construction of optical fiber, Classification of optical fibers, Acceptance angle - Numerical aperture, Losses in optical fibers, Optical fiber for communication system, Applications of optical fibers.

## TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics", S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

## REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

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# 2210501: PROGRAMMING FOR PROBLEM SOLVING

**B.Tech. I Year- I Semester.** **L T P C**
**3 0 0 3**

**Course Objectives:**

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

**Course Outcomes:** The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in the C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

**UNIT - I: Introduction to Programming**

Compilers, compiling and executing a program.
Algorithm – Flowchart / Pseudocode withexamples, Program design and structured programming
**Introduction to C Programming Language:** variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops
I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.Command line arguments

**UNIT - II: Arrays, Strings, Structures and Pointers:**

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays
Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings
Structures: Defining structures, initializing structures, unions, Array of structures
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

**UNIT - III: Preprocessor and File handling in C:**

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

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**UNIT - IV: Function and Dynamic Memory Allocation:**

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays ofdifferent data types

**UNIT - V: Searching and Sorting:**

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

**TEXT BOOKS:**

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

**REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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## 2210372: ENGINEERING WORK SHOP

**B.Tech. I Year - I Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 1 | 3 | 2.5 |

**Course Objectives:**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, Equipment and machines

**Course Outcomes:**

- Explain the design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. (L4)
- Demonstrate the design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit. (L4)
- Understand to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder. (L4)
- Demonstrate the design and model various basic prototypes in the trade of Welding. (L4)
- Explain to make various basic prototypes in the trade of Black smithy such as J shape, and S shape. (L4)
- Understand to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring. (L4)

**UNIT I - CARPENTRY & FITTING**

- **Carpentry** – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- **Fitting** – Introduction, fitting tools, sequence of operations and applications (V-Fit, Dovetail Fit & Semi-circular fit)

**Learning Outcomes:** Students should be able to,

- Understand the trade of carpentry and fitting. (L2)
- Explain the tools involved in manufacturing operations. (L3)
- Evaluate the applications of carpentry and fitting. (L4)

**UNIT II - TIN SMITHY AND BLACKSMITHY**

- **Tin-Smithy** – Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).
- **Black smithy**- Introduction, Black smithy tools, sequence of operations and applications ( Round to Square, Fan Hook and S-Hook)

**Learning Outcomes:** Students should be able to,

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- Understand the oldest manufacturing methods. (L2)
- Describe the sequence of operations involved. (L3)
- Explain the safety precautions and tools usage. (L4)

**UNITIII - HOUSE WIRING AND WELDING**

- **House-wiring** – Introduction, Electrical wiring tools, sequence of operations and applications (Parallel & Series, Two-way Switch and Tube Light)
- **Welding Practice** – Introduction, electrode, welding tools, and sequence of operations. Advantages and applications (Arc Welding)

**Learning Outcomes:**

- Students should be able to,
- Discuss the topic of Heat engines.(L3)
- Identify types of Heat engines cycles.(L5)
- Evaluate the Factors affecting routing procedure, Route Sheet.(L4)

**Text Books:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

**References:**

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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## 2210010: ENGLISH FOR SKILL ENHANCEMENT

**B.Tech. I Year - I Semester** **L T P C**
**2 0 0 2**

**Course Objectives:** This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

**Course Outcomes:** Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and writtencommunication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports invarious contexts.
6. Acquire basic proficiency in reading and writing modules of English.

**UNIT - I**

Chapter entitled '***Toasted English*' by R.K.Narayan** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

**Vocabulary**: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

**UNIT - II**

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture"published*** by Orient BlackSwan, Hyderabad.

**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreementand Subject-verb Agreement.

**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**Writing:** Nature and Style of Writing- Defining /Describing People, Objects, Places andEvents – Classifying- Providing Examples or Evidence.

**UNIT - III**

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from

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***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad.

**Vocabulary**: Words Often Confused - Words from Foreign Languages and their Use in English.

**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

**Writing:** Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

**UNIT - IV**

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad.

**Vocabulary**: Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading**: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

**UNIT - V**

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad.

**Vocabulary**: Technical Vocabulary and their Usage

**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum arecovered in the syllabus of ELCS Lab Course.***

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

**TEXT BOOK:**

1. "English: Language, Context and Culture" by Orient Black Swan Pvt. Ltd, Hyderabad. 2022. Print.

**REFERENCE BOOKS:**

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press

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3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language,Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for EngineeringStudents. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition

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## 2210175: ELEMENTS OF CIVIL ENGINEERING

**B.Tech. I Year – I Sem.** **L T P C**

**Pre-requisites: Nil** **0 0 2 1**

**Course objectives:**

- To provide practical knowledge about physical properties of minerals and rocks.
- To determine the characteristics of cement**,** Coarse & Fine aggregates.

**Course Outcomes:** At the end of the course, the student will be able to:

- Understands the method and ways of investigations required for Civil Engineering projects
- Identify the various rocks, minerals depending on geological classifications
- Evaluate the properties of cement, fine and coarse aggregates and determine its suitability for construction.

**List of Experiments:**

1. **Identification of Minerals** – Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.
2. **Identification of Rocks –** Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.
3. 1. StudyoftopographicalfeaturesfromGeologicalmaps.Identificationofsymbolsinmaps.
   **2.Simple structural Geology Problems (Folds, Faults & Unconformities)**
4. **Tests on Cement**
   a. Fineness test &Normal Consistency test.
   b. Specific gravity test, Initial and Final setting time of cement.
5. **Tests on Fine Aggregates**
   a. Specific Gravity test.
   b. Bulking of sand & Fineness modulus of Fine aggregate.
6. **Tests on Coarse Aggregate**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate.

**Text Books:**

1. IS 383 :1993 “Specification for Coarse and Fine Aggregates from Natural Sources for Concrete”.

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## 2210071: APPLIED PHYSICS LABORATORY

**B.Tech. I Year - I Semester**

| L | T | P | C |
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**Course Objectives:** The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect Experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and Resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

**Course Outcomes:** The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

**LIST OF EXPERIMENTS:**

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. V-I and L-I characteristics of light emitting diode (LED) and LASER.
7. V-I Characteristics of solar cell.
8. Determination of Energy gap of a semiconductor.
9. To determine the time constant of R-C circuit.
10. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – Torsional pendulum as an example.
12. Determination of magnetic field induction along the axis of a current carrying coil.

**REFERENCE BOOK:**

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

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## 2210571: PROGRAMMING FOR PROBLEM SOLVING LABORATORY

**B.Tech. I Year I – Semester.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

*[Note: The programs may be executed using any available Open Source/ Freely available IDESome of the Tools available are:*
*CodeLite: https://codelite.org/ Code: Blocks:*
*http://www.codeblocks.org/*
*DevCpp: http://www.bloodshed.net/evcpp.html*
*Eclipse: http://www.eclipse.org*
This list is not exhaustive and is NOT in any order of preference

**Course Objectives:** The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To create, read from and write to text and binary files

**Course Outcomes:** The candidate is expected to be able to:

- Formulate the algorithms for simple problems
- Able to develop programs based on condition checking
- Implement pyramid programs
- Able to perform matrix applications
- Modularize the code with functions so that they can be reused
- Create, read and write to and from simple text and binary files

**Simple numeric problems:**

a. Write a program for the simple, compound interest.
b. Write a program to implement bit-wise operators.
c. Write a program for converting Fahrenheit to Celsius.
d. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.
e. Writeasimpleprogramtofindlargestoftwoandthreenumbersusingconditionaloperator.
f. Writeaprogramforswappingtwonumberswithandwithoutusingthirdvariableandusingbitwiseoperators.

**Condition branching and statements:**

a. Write a program for finding larges of three numbers.
b. Write a program that declares Class awarded for a given percentage of marks, where marks<40%=Failed, 40% to<60% = Second class, 60% to<70%=First class, >=70%=Distinction. Read percentage from standard input.
c. Write a C program to find the roots of a Quadratic equation.

d. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, %and use Switch Statement)

**Condition branching and loops:**

a. Write a program to find whether the given number is a prime or not.
b. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
c. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, number=5 and no. of rows = 3, the output should be:

5x1=5
5x2=10
5x3=15

d. Write a program that shows the binary equivalent of a given positive number between0to255.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to calculate the following ,where x is a fractional value.$1-x/2+x^2/4-x^3/6$
h. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:$1+x+x^2+x^3+\ldots.+x^n$. For example: if n=3 and x=5, then the program compute1+5+25+125.
i. Write a C program to construct a pyramid of numbers as follows:

| | | | | |
|---|---|---|---|---|
| 1 | * | 1 | 1 | * |
| 12 | ** | 23 | 22 | ** |
| 123 | *** | 456 | 333 | *** |
| | | | 4444 | ** |
| | | | | * |

j. Write a C program to find given number is Armstrong number or not.
k. Write a C program to find given number is Perfect number or not.

**Arrays, Strings, Pointers and Structures:**

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a program to compute Mean, Variance, Standard Deviation, Sorting of n elements in single dimension array.
c. Write a C program that perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
d. Write a C program that sorts a given array of names.
e. Write a C program that perform the following operations:
   i. To insert a sub-string into a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.

f. Write a program for reading elements using pointer in to array and display the values using array.
g. Write a program for display values reverse order from array using pointer.
h. Write a program through pointer variable to sum of n elements from array.
i. Write a program to implement student information by using structure to function.
j. Write a program to sort student id or name using structures.

**Functions:**

a. Write a C program to find factorial of a given number using functions.
b. Write a C program to perform swapping using functions.
c. Write a C program to find LCM, GCD of two numbers using functions.
d. Write a C program to implement sorting using functions.
e. Write a C program to create and print two dimensional array using functions.
f. Write a C program to find factorial of a given number using recursion.
g. Write a C program to find Fibonacci series using recursion
h. Write a C program to implement Towers of Hanoi problem using recursion.

**Files:**

a. Write a C program to display the contents of a file to standard out put device.
b. Write a C program which copies one file to another, replacing all lower case characters with their upper case equivalents.
c. Write a C program to count the occurrence of a character in a text file. The file name and the character are supplied as command line arguments.
d. Write a C program to merge two files in to a third file (i.e. ,the contents of the first file followed by those of these cond are put in the third file).

**CASE STUDY I: Develop Sample Student Data base**

Create a structure to specify data on students given below: Roll number, Name, Department, Course, Year of joining

Assume that there are not more than 15 students in the collage.

(a) Write a function to print names of all students who joined in a particular year.
(b) Write a function to print the data of a student whose roll number is given.

**CASE STUDY 2: Perform simple Bank Transactions**

Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 20 customers in the bank.
(a) Write a function to print the Account number and name of each customer with balance below Rs. 100.
(b) If a customer request for withdrawal or deposit, it is given in the form: Acct. no, amount, code (1 for deposit, 0 for withdrawal)
Write a program to give a message, “The balance is insufficient for the specified with drawal”.

**CASE STUDY 3: Provide Serial Numbers for Engine parts**

An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.
(a) Specify a structure to store information corresponding to a part.
(b) Retrieve information on parts with serial numbers between BB1 and CC6.

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**Reference Books**


1. Byron Gottfried, Schaum‟s Outline of Programming with C, Mc Graw-Hill
2. Let us C by YashavantKanetkar BPB publications(16th Edition)
3. B.A.ForouzanandR.F.GilbergCProgrammingandDataStructures,CengageLearning,(3rd Edition)
4. BrianW.KernighanandDennisM.Ritchie,TheCProgrammingLanguage,PrenticeHallofIndia
5. R. G. Dromey, How to solve It by Computer, Pearson(16th Impression)
6. Programming in C, Stephen G.Kochan, Fourth Edition, and Pearson Education.
7. Herbert Schildt, C:TheCompleteReference, McGrawHill,4th Edition.

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## 2210073: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

**B.Tech. I Year I Sem.**

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The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and the students with the use of English in everyday situations both in formal and informal contexts.

**Course Objective**

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized andindependent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent,intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation ofEnglish by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact ofdialects.
- ✓ To train students to use language appropriately for public speaking, groupdiscussions and interviews

**Course Outcomes:** Students will be able to:

- ✓ Understand the nuances of English language through audio- visual experience and groupactivities
- ✓ Neutralise their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

**Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:**

**a. Computer Assisted Language Learning (CALL) Lab**
**b. Interactive Communication Skills (ICS) Lab**

**Listening Skills:**
**Objectives**

1. To enable students develop their listening skills so that they may appreciate the role in theLSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speechof people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills:**
Objectives

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1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

**Exercise – ICALL Lab**:
*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
*Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*
**ICS Lab**:
*Understand:* Spoken vs. Written language- Formal and Informal English.
*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise – IICALL Lab**:
*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*
**ICS Lab**:
*Understand:* Features of Good Conversation – Strategies for Effective Communication.
*Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

**Exercise - IIICALL Lab:**
*Understand:* Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*
**ICS Lab**:
*Understand:* Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**Exercise – IVCALL Lab**:
*Understand:* Listening for General Details.
*Practice:* Listening Comprehension Tests - *Testing Exercises*
**ICS Lab**:
*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.
*Practice:* Making a Short Speech – Extempore- Making a Presentation.

**Exercise – VCALL Lab:**
*Understand:* Listening for Specific Details.
*Practice:* Listening Comprehension Tests -*Testing Exercises*
**ICS Lab**:
*Understand:* Group Discussion
*Practice:* Group Discussion

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**Minimum Requirement of infrastructural facilities for ELCS Lab:**

**1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

**System Requirement (Hardware component):**

*Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab :**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

**Source of Material (Master Copy):**

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

**REFERENCE BOOKS:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press

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## 2210021: ENVIRONMENTAL SCIENCE

**B.Tech. I Year-I Semester** **L T P C**
**3 0 0 0**

**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**Course Outcomes:**

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

**UNIT - I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil.

**Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental**

**Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

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**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water,R22 B.Tech. ECE Syllabus JNTU HYDERABAD biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

**Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle
assessment (LCA), Low carbon life style.

**TEXT BOOKS:**

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications

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# I-II

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## 2220002: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to all)

**B.Tech. I Year- IISem** **L T P C**
**3 1 0 4**

**Pre-requisites:** Mathematical Knowledge at pre-university level

**Course Objectives:** To learn

- Methods of solving the differential equations of first order and first degree.
- Concept of higher order liner differential equations.
- Concept, properties of Laplace transforms, solving ordinary differential equations by using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valuedfunctions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course outcomes: After learning the contents of this paper the student must be able to**

CO1: Identify whether the given first order differential equation is exact ornot.
CO2: Solve higher differential equation and apply the concept of differential equation to real world problems.
CO3: Usethe Laplace transforms techniques for solving ODE's.
CO4: Apply the Del operator to scalar and vector point functions.
CO5: Evaluate the line, surface and volume integrals and converting them from one to another.

**UNIT-I: FirstOrderODE8L**

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

**UNIT-II: Ordinary Differential Equations ofHigherOrder10 L**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}$, sin ax , cos ax, polynomials in x, $e^{ax}$ V(x) and x V(x), method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

**UNIT-III:Laplacetransforms10 L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse

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Laplace transform by different methods, convolution theorem (withoutproof). Applications: solving Initial value problems by Laplace Transform method.

**UNIT-IV:VectorDifferentiation10 L**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

**UNIT-V:VectorIntegration10 L**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications**.**

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition,2016.

**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dassand Er. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, NewDelhi.

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## 2220009: ENGINEERING CHEMISTRY

**B.Tech. I Year. II Semester** **L T P C**
3 1 0 4

**Course Objectives:**

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

**Course Outcomes:**

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. Theycanpredictpotentialapplicationsofchemistryandpracticalutilityinordertobecomegood engineers and entrepreneurs.

**UNIT - I: Water and its treatment: [8]**

**Introduction to hardness of water – Estimation of hardness of water by complexometric method** and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potablewater-Disinfectionofpotablewaterbychlorinationandbreak-pointchlorination.Defluoridation-Determination of $F^-$ ion by ion- selective electrode method. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion-exchange processes. Desalination of water – Reverse osmosis.

**UNIT – II Battery Chemistry & Corrosion** [8]

Introduction-Classification of batteries-primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solarcells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanismofelectrochemicalcorrosion,Typesofcorrosion:Galvanic,water-lineandpittingcorrosion.

Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed currentmethods.

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**UNIT - III: Polymeric materials: [8]**

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

**UNIT - IV: Energy Sources: [8]**

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

**UNIT - V**: **Engineering Materials: [8]**

**Cement: Portland cement, its composition, setting and hardening.**

Smart materials and their engineering applications

Shape memory materials- PolyL-Lacticacid.Thermoresponsematerials- Polyacrylamides,Polyvinyl amides

Lubricants:Classificationoflubricantswithexamples-characteristicsofagoodlubricants-mechanism of lubrication (thick film, thinfilm and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and firepoint.

**TEXT BOOKS:**

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company,2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications,2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, WileyPublications.

**REFERENCE BOOKS:**

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi(2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi(2011)

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## 2220371: ENGINEERING DRAWING PRACTICE

**B.Tech. I Year II Sem**

| L | T | P | C |
|---|---|---|---|
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**Pre-requisites:** Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

**COURSE OBJECTIVES**

1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and pictorial views of solids.

**COURSE OUTCOMES:** After completion of the course the student is able to

1. Familiarize with BIS standards and conventions used in engineering graphics. (L3)
2. Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc. andconstruct various reduced scales e.g., plain and diagonal scale. (L2)
3. Ability to draw orthographic projections and isometric projections of given engineering components. (L3)
4. Visualize different views like elevation and plan for a given line, plane figures or solid objects. (L2)
5. Develop the lateral surfaces of simple solids. (L5)
6. To know about isometric projection. (L2)

**UNIT – 1** **CLASSES:12**

**Introduction To Engineering Drawing**

Principles of Engineering Graphics and their Significance-Drawing Instruments and their Uses-Conventions in Drawing-BIS -Lettering and Dimensioning.

**Geometrical Constructions**: Bisecting a Line, Arc. Dividing A Line into 'N' Equal Parts,Construction of Polygons, Division of Circle into Equal Parts (8 And 12)

**Construction of Scales:** Plain and Diagonal Scale.

**Conic Sections:** Ellipse, Parabola, Hyperbola and Rectangular Hyperbola- GeneralMethods only.

**Engineering Curves:** Cycloid, Epicycloid, Hypocycloid.

**Involutes:** For Circle, Triangle, Square, Pentagon and Hexagon.

**LEARNING OUTCOME:**

1. To understand the basic standards, conventions of engineering drawing and how to use the instruments in drawing. (L1)
2. Learn and draw the various types of curves used in engineering application. (L2)

**UNIT – 2** **CLASSES:12**

**Orthographic Projections**

Principles- Assumptions- Different Angles of Projection.

**Projections of Points-** Located in all the quadrants

**Projections of Lines-** Parallel, Perpendicular, inclined to one plane and inclined to bothplanes.

**Projections of Planes:** Simple and auxiliary position of a plane.

**LEARNING OUTCOME:**

1. Knowledge in various planes of projections. (L1)
2. To draw the front view, top view and side views of the given geometrical elements. (L2)

**UNIT – 3** **CLASSES :09**

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**Projections Of Solids**

Classification of solids- simple and inclined to one plane position of Prisms, Pyramids, Cylinder and Cone

**LEARNING OUTCOME:**

1. To understand the various solid types. (L2)
2. To draw all the views of the given solid in all possible orientations. (L3)

**UNIT – 4** **CLASSES :12**

**Section Of Solids**

Types of Section Planes, Sectioning of Prisms, Pyramids, Cylinders and Cones.

**Development Of surfaces**

Development of surfaces of right Regular Solids- Parallel Line Method, Radial Line Method.

**LEARNING OUTCOME:**

1. To identify the cut surfaces and represent the sectional views graphically when the solid is sectioned. (L4)
2. To develop the surfaces of solid using various methods. (L5)

**UNIT – 5** **CLASSES :09**

**Isometric Projections**

Principles, Isometric Views of Planes, Solids- Box Method, Offset Method, Compound solids, Sectioned Solids. Conversion of Isometric to Multi view projection. And vice versa

**LEARNING OUTCOME:**

1. Knowledge in principles of isometric projection. (L2)
2. Conversion of isometric to orthographic and vice-versa. (L2)

**TEXT BOOKS:**

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishers,2012.
2. K.Veenugopal, –Engineering Drawing and Graphics + AutoCAD New Age International Pvt. Ltd, 2011.

**REFERENCE BOOKS:**

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers Engineering Drawing- Johle/Tata Macgraw Hill.
2. Basanth Agrawal and C M Agrawal –Engineering Drawing 2nd Edition -McGraw-Hill Education (India) Pvt.Ltd

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## 2220122- APPLIED MECHANICS

**B.Tech. I Year-II Sem** **L T P C**

**Prerequisites: Nil** **3 0 0 3**

**Course Objectives:**

1. To solve the resultant of any force system.
2. To analyze the types of frication for moving bodies and problems related to friction.
3. To determine the centroid of an area and center of gravity of body.
4. To understand the concept of area moment and mass moment about any axes.
5. Understand the work-energy principle

**Course Outcomes:** After completion of the course the student is able to

1. Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.
2. Analyze the bodies on rough horizontal and inclined planes and connected Bodies
3. Determine the centroid of composite areas, centre of gravity of composite bodies
4. Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.
5. Apply work-energy principle to solve the rigid body problems.
6. Appraise the influences of human factor considerations on engineering design.

**UNIT - I**

**Introduction to Mechanics**: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

**UNIT - II**

**Friction:** Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Simple ScrewJack

**UNIT - III**

**Centroid and Center of Gravity**: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity - Center of gravity of compositebodies.

**UNIT - IV**

**Area moments of Inertia**: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures.

**Mass Moment of Inertia**: Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies – Product of Inertia.

**UNIT - V**

**Kinetics of Rigid Bodies:** Types of motion, D"Alemberts principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; kinetic of rigid body rotation.

**TEXT BOOKS:**

1. Engineering Mechanics by R.K.Bansal, Laxmi Publications (P) Ltd.

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2. Engineering Mechanics by S.S. Bhavikatti and K.G.Rajashekarappa, New Age International (P) Ltd Publishers.

**REFERENCES:**

1. Engineering Mechanics by S.P. Timoshenko & D.H. Young, J.V.Rao, Sukumar Pati, McGraw Hill Education.
2. Engineering Mechanics Statics and Dynamics by R.C. Hibbeler, Pearson Education India.
3. Engineering Mechanics Statics and Dynamics by Tayal A.K, UmeshPublications.
4. Engineering Mechanics: Statics and Dynamics by S.Rajasekaran and G.Sankarasubramaniam, Vikas Publishing house Pvt Ltd.

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# 2220123 - SURVEYING

**B.Tech. I Year-II Sem** **L T PC**
**Prerequisites: Nil** **2 0 0 2**

**Course Objectives:** The objective of the course is

1. To know the principles and methods of surveying
2. To measure horizontal and vertical- distances and angles
3. To recording of observation accurately and Perform calculations based on the observation
4. To Identify source of errors and rectification methods
5. To apply surveying principles to determine areas and volumes and setting out curves
6. To use modern surveying equipment's for accurate results

**Course Outcomes:** At the end of the course the student will able to

1. Apply the knowledge to calculate angles, distances and levels
2. Identify data collection methods and prepare field notes for levels, Interpret survey data and compute areas and volumes
3. Understand working principles of survey instruments and apply the knowledge of trigonometric levelling
4. Understand and apply the corrective measures on measurement errors
5. Apply the knowledge on curve alignment by different methods
6. Understand & apply the principles and concepts of modern equipment and its methodologies

## UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Different methods of distance measurement, direct methods of distance measurement using chain/tape, ranging, Tape corrections.

Compass and its types, Bearings, Included angles, Local Attraction, Magnetic Declination and dip

## UNIT - II

Levelling and Contouring: Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas and volumes - Determination of areas for regular and irregular boundary, Determination of volume of earth work for level section, volume of borrow pits, capacity of reservoirs.

## UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry

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**UNIT - IV**

Traversing: Methods of Traversing, traverse computations and adjustments, Omitted measurements.

Curves: Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves**.**

**UNIT - V**

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

**TEXT BOOKS:**

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi.
2. Duggal S K, “Surveying (Vol – 1 & 2)”, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3. N N Basak, “Surveying and Levelling”, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Chandra A M, “Plane Surveying and Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi.

**REFERENCES:**

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Arora K R “Surveying (Vol 1, 2 & 3), Standard Book House, Delhi.
3. R. Subramanian, “Surveying and Levelling”, Oxford University Press, New Delhi.

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## 2220572: DATA STRUCTURES LABORATORY

| **B.Tech. I Year II – Sem.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| | **0** | **1** | **2** | **2** |

**Prerequisites:** A Course on "Programming for problem solving".

**Course Objectives:**

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

**Course Outcomes:**

- Ability to develop C programs for computing and real life applications using basic
- elements like control statements, arrays, functions, pointers and strings, and data
- structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

**List of Experiments**

1. Write a program that uses functions to perform the following operations on singly linked list.: i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.: i) Creation ii) Insertion iii) Deletion
3. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion
4. Write a program that implement stack operations using i) Arrays ii) Pointers
5. Write a c program to implement infix to postfix conversion using stack.
6. Write a c program to implement postfix evaluation.
7. Write a program that implement Queue operations using i) Arrays ii) Pointers
8. Write a program that implements the following sorting methods to sort a given list of Integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort
9. Write a program that implements the following sorting methods to sort a given list of Integers in ascending order i) Merge sort ii) Quick sort
10. Write a program that use both recursive and non-recursive functions to perform the Following searching operations for a Key value in a given list of integers: i) Linear search ii).Binary search
11. Write a program to implement the tree traversal methods
12. Write a program to implement the graph traversal methods.

**CASE STUDY-1 Balanced Brackets**

A bracket is considered to be any one of the following characters: (, ), {, }, [, or ].

Two brackets are considered to be a *matched pair* if the an opening bracket (i.e., (, [, or {) occurs to the left of a closing bracket (i.e., ), ], or }) *of the exact same type*. There are three types of matched pairs of brackets: [], {}, and ().

A matching pair of brackets is *not balanced* if the set of brackets it encloses are not matched. For example, {[(])} is not balanced because the contents in between { and } are not balanced. The pair of square brackets encloses a single, unbalanced opening bracket, (, and the pair of parentheses encloses a single, unbalanced closing square bracket, ].

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By this logic, we say a sequence of brackets is *balanced* if the following conditions are met:

- It contains no unmatched brackets.
- The subset of brackets enclosed within the confines of a matched pair of brackets is also a matched pair of brackets.

Given strings of brackets, determine whether each sequence of brackets is balanced. If a string is balanced, return YES. Otherwise, return NO.

**CASE STUDY-2 Minimum Average Waiting Time**

Mr. Raju owns a pizza restaurant and he manages it in his own way. While in a normal restaurant, a customer is served by following the first-come, first-served rule, Raju simply minimizes the average waiting time of his customers. So he gets to decide who is served first, regardless of how sooner or later a person comes.

Different kinds of pizzas take different amounts of time to cook. Also, once he starts cooking a pizza, he cannot cook another pizza until the first pizza is completely cooked. Let's say we have three customers who come at time t=0, t=1, & t=2 respectively, and the time needed to cook their pizzas is 3, 9, & 6 respectively. If Raju applies first-come, first-served rule, then the waiting time of three customers is 3, 11, & 16 respectively. The average waiting time in this case is (3 + 11 + 16) / 3 = 10. This is not an optimized solution. After serving the first customer at time t=3, Raju can choose to serve the third customer. In that case, the waiting time will be 3, 7, & 17 respectively. Hence the average waiting time is (3 + 7 + 17) / 3 = 9.

Help Raju achieve the minimum average waiting time. For the sake of simplicity, just find the integer part of the minimum average waiting time.

**Note:**

- The waiting time is calculated as the difference between the time a customer orders pizza (the time at which they enter the shop) and the time she is served.
- Cook does not know about the future orders.

**TEXT BOOKS:**

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

**REFERENCES:**

1. Data structures: A Pseudocode Approach with C, R.F.GilbergAndB.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON

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## 2220072: ENGINEERING CHEMISTRY LABORATORY

**B.Tech. I Year. I Semester** **L T P C**

**0 0 2 1**

Course Objectives: **The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:**

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in thelaboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

**Course Outcomes:** The experiments will make the student gain skills on:

- Determinationofparameterslikehardnessofwaterandrateofcorrosionofmildsteelinvarious conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids andbases.
- Students are able to prepare polymers like bakelite andnylon-6.
- Estimations saponification value, surface tension and viscosity of lubricantoils.

**List of Experiments:**

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.

III. **Potentiometry:** Estimation of the amount of $Fe^{+2}$ by Potentiomentry.

IV. **pH Metry:** Determination of an acid concentration using pHmeter.

V. **Preparations:**

1. Preparation of Bakelite.
2. Preparation Nylon –6.

II. **Lubricants:**

1. Estimation of acid value of given lubricantoil.
2. Estimation of Viscosity of lubricant oil using Ostwald'sViscometer.

III. **Corrosion:**Determinationofrateofcorrosionofmildsteelinthepresenceandabsenceofinhibitor.

IV. **Virtual lab experiments**

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

**REFERENCE BOOKS:**

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi(2022)
2. Vogel's text book of practical organic chemistry 5thedition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBSPublications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi(2007).

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## 2220176 - Surveying Laboratory – 1

**B.Tech. I Year- II Sem** **L T P C**

**Pre-requisites: Surveying** **0 0 2 1**

**Course Objectives:** The objective of the course is

1. To learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
2. To learn and understand various instrument used in surveying.
3. To understand how to calculate Area of plot and Ground.
4. To understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile.
5. To determination of distance, area using chain, compass and plane table surveying
6. To Recording the observation accurately and Perform calculations based on the observation

**Course Outcomes:** At the end of the course the student will able to

1. Prepare Map and Plan for required site with suitable scale.
2. Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
4. Measure the distance, area of the field using the instruments chain, compass, plane table and plot the same.
5. Know the concepts of leveling, and perform & plot the cross & longitudinal sectioning.
6. Judge the profile of ground by observing the available existing contour map.

**List of Experiments**

**Chain surveying**

1. Chaining of a line using chain, measurements of area by cross staff survey.
2. Measurement of distance between two points when there is an obstacle for both chaining and ranging.

**Compass surveying**

3. Traversing by compass and adjustments in included angles and measurement of area - graphical adjustments.
4. Distance between two inaccessible points by compass.

**Plane Table Surveying**

5. Measurement & Plotting of the area by Radiation method.
6. Determination of Positions objects by Intersection Method
7. Traverse by Plane table Survey.

**Levelling**

8. Measurement of elevation of various given points.
9. Elevation difference between two given points by reciprocal levelling.
10. Longitudinal Levelling
11. Cross – section Levelling

**12.** Plotting of Contours by Indirect Method

**References**

1. Surveying Theory and Practice by James M. Anderson and Edward M. Mikhail, 7th Edition, McGraw Hill, 2001.

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2. Surveying by Bannister and S. Raymond, 7th Edition, Longman 2004.
3. Fundamentals of Surveying by Roy S.K, 2nd Edition, Prentice' Hall of India, 2004.
4. Surveying Vol I & II by Arora K.R, Standard Book house, 10th Edition 2008.

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# II-I

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# 2230124 – BUILDING MATERIALS, CONSTRUCTION AND PLANNING

| B. Tech II Year I Sem | L | T | P | C |
|---|---|---|---|---|
| Prerequisites: Elements of Civil Engineering | 3 | 0 | 0 | 3 |

**Course Objectives:** The objective of the course is

1. To learn various construction materials for constructing a building.
2. To know the process involved to manufacture of cement, tests on cement, grades of concrete, tests on concrete, NDT, admixtures used for concrete
3. To understand different building components
4. To understand Plumbing services using different materials
5. To know the types of form work, utilisation, preparation of mortars for finishing work.
6. To learn Bye laws to construct a building

**Course Outcomes:** At the end of the course the student will able to

1. Understand stones, bricks, tiles, timber and other type of modern material, its properties and applications in construction
2. Analyse properties of cement, concrete, admixtures and study its properties and uses in construction
3. Apply the concepts in functioning of buildings components and building services.
4. Analyse load bearing and framed structure and list the types of form work and uses and also preparation of mortars for finishing work.
5. Understand principles of building planning and bye laws to construct a building.

**UNIT I**

**Stones and Bricks, Tiles:** Building stones – classifications and quarrying – properties – structural requirements – dressing. Stone masonry – types; Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics. Brick masonry – types – bonds.

**Timber and Other modern materials:** Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics. Geomembranes and Geotextiles for earth reinforcement

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Predict the properties of building stones and its classifications.
- Understand the composition, types and concept of various methods of manufacture of bricks
- Understand timber and other modern materials which are used for constructions.

**UNIT - II**

**Cement, Concrete and Admixtures:** Cements – Grade of cements - Ingredients of cement – Types and properties of cement - Manufacture – Chemical composition – Hydration - field & lab tests on cement.
Concrete – Types – Properties – Various test on concrete.
Admixtures – mineral & chemical admixtures – uses.

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**Learning Outcomes:**

At the end of this unit, the student will be able to

- Predict the properties of cement its classifications.
- Predict the properties of concrete its classifications.
- Understand the importance of mineral and chemical admixtures.

**UNIT – III**

**Building Components:** Lintels, Arches, walls, stair cases, floors – types of floors, roofs -types of roofs – Damp Proof Course ; Joinery – doors – windows – types. foundations – types.

**Building Services:** Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Harzards – Classification of fire resistant materials and constructions.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the various components of buildings and its purposes.
- Understand the importance of building services.

**UNIT – IV**

**Structural Systems:** Load Bearing Structure - Framed Structure - Load transfer mechanism.

**Form work: Types:** Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

**Mortars and Finishers:** Lime and Cement Mortars - Preparation of mortar Plastering, Pointing, Painting, Claddings – Types – Tiles.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the structural system
- Know the various types of form work and its design.
- Understand purpose of mortars and finishers.

**UNIT – V**

**Stairs and Building Planning:** Stairs – Types – Requirement of good stairs - Principles of Building Planning, Classification of buildings and Building by laws.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the different types of stairs.
- Know the principles, classification of building and building by laws.

**TEXT BOOKS:**

1. Building Materials and Construction by Arora & Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

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**REFERENCES:**


1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
2. Building Materials by Duggal, New Age International.
3. Building Materials by P. C. Varghese, PHI Publications.
4. Building Construction by PC Varghese PHI Publications.
5. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
6. Alternate Building Materials and Technology by Jagadish, Venkatarama Reddy and others; New Age Publications.

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# 2230125 - STRENGTH OF MATERIALS – I

**B. Tech. II Year I Sem** **L T P C**

**Pre-requisites**: Engineering Mechanics **3 1 0 4**

**Course Objective:** The objective of the course is

1. To understand the concepts of stress, strain and strain energy
2. To calculate the shear force and bending moments for various loading conditions
3. To analyze the beams under flexural stresses
4. To analyze the beams under shear stresses
5. To calculate the deflections of beams under different loading conditions
6. To understand principal stresses and strains in structural members and various theories of failures.

**Course Outcomes:** At the end of the course the student will able to

1. Evaluate the strength and deformation of members subjected to axial load.
2. Analyse the shear force and bending moment diagrams for determinate beams subjected to various loads.
3. Analyse the bending stresses and shear stresses in various beam sections
4. Analyse the slope and deflection of beams by various methods
5. Evaluate the stresses on oblique plane and understand the concepts of various theories of failures.

**UNIT - I**

**Simple stresses and strains:** Concept of stress and strain – Types of stresses and strains – stress-Strain diagram for mild steel rods - Elasticity and plasticity – Hooke's law – Elastic constants – Relation between Elastic constants - Poisson's ratio – Bars of varying section – composite bars – Temperature stresses.

**Strain energy**: Resilience – Gradual, sudden, and impact loadings – simple applications.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the behaviour of axially loaded members of different cross section.
- Analyse bars subjected to thermal stresses.
- Evaluate strain energy stored in a body subjected to external load.

**UNIT - II**

**Shear force and bending moment:** Beam - Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for determinate beams – Point of contraflexure – Relations between Load, S.F. and B.M.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the various types of beams and external loads.
- Evaluate the variation of Shear Force and Bending Moment along the length of the beam.

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**UNIT - III**

**Flexural stresses:** Pure bending - Theory of simple bending – Assumptions Expression for bending stress - Neutral Axis and Moment of Resistance –- bending stresses in symmetrical sections and unsymmetrical sections - Section Modulus

**Shear stresses:** Expression for Shear stress at a section – Shear stress distribution for different sections.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the concept bending stress and shear stress.
- Evaluate the variation of shear stress and bending stress distribution across the section.

**UNIT - IV**

**Deflection of beams:** Slope and deflection – Double integration method - Macaulay's method – Moment area method - Conjugate beam method

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the concept slope, deflection and elastic curve of beams.
- Evaluate the slope and deflection of beams by different methods.

**UNIT - V**

**Principal stresses and Strains:** Methods of Determining Stresses on oblique section – Analytical and graphical solutions – Strain on an Oblique plane.

**Theories of failure:** Introduction – Various theories of failure

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the concept of principal stresses
- Evaluate stresses and factor of safety according to various theories of failure.

**TEXT BOOKS:**

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain, Laxmi Publications Pvt Limited.
3. Strength of Materials by R. Subramanian, Oxford University Press.
4. Strength of Materials by S. Ramamrutham, Dhanpat Rai Publishing Company (p) Ltd.
5. Strength of Materials by R.S.Khurmi, S.Chand and Co

**REFERENCES:**

1. Mechanics of Materials by R.C. Hibbeler, Prentice Hall publications.
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications.
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge University Press.
4. Strength of Materials by R.K. Bansal, Lakshmi Publications Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, Universities Press.

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# 2230126 – FLUID MECHANICS

**B. Tech. II Year I Sem** **L T P C**

**Pre-requisites**: **-** **3 1 0 4**

**Course Objectives:** The objective of the course is

1. To introduce the concepts of fluid mechanics useful in Civil Engineering applications
2. To provide a first level exposure to the students to fluid statics, kinematics and dynamics.
3. To learn about the application of mass, energy and momentum conservation laws for fluid flows
4. To train and analyse engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
5. To obtain the velocity and pressure variations in various types of simple flows
6. To prepare a student to build a good fundamental background useful in the application intensive courses covering hydraulics, hydraulic machinery and hydrology

**Course Outcomes:** At the end of the course the student will able to

1. Understand the basic terms used in fluid mechanics and principles of fluid statics.
2. Understand the broad principles of fluid kinematics and dynamics
3. Apply the bernoulis principle in different flow measurements such as venturimeter, orifice meter, notches and weirs
4. Evaluate the minor and major losses through pipes and analyse the pipe networks using different methods
5. Apply the continuity, momentum and energy principles in boundary layer concepts.

**UNIT - I**

**Properties of Fluid**

Basic concepts: Density, Specific weight, Specific volume, Specific gravity, Kinematic and dynamic viscosity - variation of viscosity with temperature - Newton law of viscosity - vapour pressure - boiling point - surface tension and capillarity

**Fluid Statics**

Fluid Pressure at a point, variation of pressure in a fluid, Pascal's law, measurement of pressure - simple and differential manometers - Hydrostatic pressure and force: horizontal, vertical and inclined surfaces - Buoyancy

**Learning Outcomes:**

At the end of the unit, student should able to,

- Understand the properties of fluids
- Measure the pressure of fluid

**UNIT - II**

**Fluid Kinematics**

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two- and three-dimensional flows - Stream line - path line - streak line and stream tube - stream function, velocity potential function - One, two- and three-dimensional continuity equations in Cartesian coordinates.

**Fluid Dynamics**

Euler's and Bernoulli's equation - Impulse-momentum equation and its applications – Bernoulli's equation to real fluid flows.

**Learning Outcomes:**

At the end of the unit, student should able to,

- Understand the concepts of fluid kinematics
- Understand the concepts of fluid dynamics

**UNIT - III**

**Flow Measurement in Pipes**

Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube - Momentum principle - Forces exerted by fluid flow on pipe bend

**Flow Over Notches & Weirs**

Flow through rectangular; triangular and trapezoidal notches and weirs - Velocity of approach - Broad crested weir.

**Learning Outcomes:**

At the end of the unit, student should able to,

- Measure the flow in pipes through venture and orifice meter
- Measure the flow in pipes through notches and weir

**UNIT - IV**

**Flow through Pipes**

Reynolds experiment - Loss of head through pipes – Darcy-Weisbach equation - minor losses - total energy line - hydraulic grade line - pipes in series - equivalent pipes - pipes in parallel – syphon - power transmission through pipes - water hammer in pipes and control measures.

**Learning Outcomes:**

At the end of the unit, student should able to,

- Able to measure the minor and major losses in pipes
- Analyse the pipe networks using different methods

**UNIT - V**

**Boundary Layer Concepts**

Boundary layer: Definition, laminar and turbulent boundary layers - boundary layer thickness - displacement thickness - momentum thickness and energy thickness - Laminar sub-layer, smooth and rough boundaries - Boundary layer separation and Control - Definition of Drag and Lift and types drag - magnus effect.

**Learning Outcomes:**

At the end of the unit, student should able to,

- Understand the laminar and turbulent flow
- Understand the concepts of boundary layer

**TEXT BOOKS:**

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.




3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

**REFERENCES:**

1. Theory and Applications of Fluid Mechanics by K. Subramanya, Tata McGraw Hill
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
3. Fluid Mechanics and Machinery by C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
4. Fluid mechanics & Hydraulic Machines by Domkundwar & Domkundwar Dhanpat Rai &Co
5. Fluid Mechanics and Hydraulic Machines by R. K. Bansal, Laxmi Publication Pvt Ltd.

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# 2230177 - SURVEYING LABORATORY - II

**B.Tech. II Year I Sem** **L T P C**

**Pre-requisites**: Surveying **0 1 2 2**

**Course Objectives:** The objective of the course is

1. To understand the basic concepts and principles used in levelling surveying & total station surveying.
2. To learn and understand about theodolite and total station in surveying.
3. To know calculation of Area of plot and Ground.
4. To understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile using theodolite.
5. To measure the angles, distances, area and contour map using total station.
6. To plot the curve and stakeout using total station.

**Course Outcomes:**

At the end of the course student will be able to:

1. Understand the basic concepts of theodolite and total station.
2. Apply the principles of surveying in Preparation of Map and Plan for required site with suitable scale.
3. Evaluate Quantity of earthwork required for formation level for Road and Railway Alignment.
4. Analyse various type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
5. Analyse the profile of ground by observing the available existing contour map.

**List of Experiments:**

**Theodolite surveying:**

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing (Gales traverse table).
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

**Total Station:**

7. Area Measurement
8. Remote Elevation Measurement
9. Missing Line Measurement
10. Longitudinal & Cross Section Profile
11. Contouring
12. Stake Out
13. Providing a Simple Circular Curve

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# 2230178 - STRENGTH OF MATERIALS LABORATORY

**B.Tech. II Year I Sem.** **L T P C**

**Pre-requisites**: Strength of Materials - I **0 0 2 1**

**Course Objectives:** The objective of the course is

1. To make measurements of different strains, stress and elastic properties of materials used in Civil Engineering.
2. To provide physical observations to complement concepts learnt
3. To introduce experimental procedures and common measurement instruments, equipment, devices.
4. To exposure to a variety of established material testing procedures and techniques
5. To different methods of evaluation and inferences drawn from observations

**Course Outcomes:** At the end of the course the student will able to

1. Analyse properties of steel, brick and concrete
2. Analyse deflection, bending strength and young's modulus of cantilever and simply supported beam.
3. Evaluate modulus of rigidity of different materials
4. Evaluate hardness value of different material
5. Evaluate impact, shear strength, stiffness and modulus of elasticity of material

**List of Experiments:**

1. Tension test
2. Bending test on (Steel / Wood) cantilever beam.
3. Bending test on simply support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on concrete or bricks
8. Impact test
9. Shear test
10. Verification of Maxwell's reciprocal theorem on beams.

**REFERENCES:**

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Strength of Materials by R.K. Bansal, Lakshmi Publications Pvt. Ltd.

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# II-II

**MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT**

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# 2240127 – ENGINEERING GEOLOGY

**B.Tech. II Year II Sem** **L T P C**

**Pre-requisites**: Nil **2 0 0 2**

**Course Objective:** The objective of the course is

1. To understand the role of Geological concepts in Civil Engineering.
2. To understand weathering process and mass movement rocks
3. To evaluate different types of minerals and rock compositions.
4. To understand different geological structures and its suitability for groundwater and building construction
5. To evaluate subsurface information through geophysical investigations
6. To apply geological principles in selecting sites for tunnels, dams and reservoirs

**Course Outcomes:** At the end of the course the student will able to

1. Understand the role of Geological concepts in Civil Engineering, and also weathering process and mass movement rocks.
2. Evaluate different types of minerals and rock compositions.
3. Analyse different geological structures and its suitability for groundwater and building construction
4. Evaluate subsurface information through geophysical investigations
5. Apply geological principles in selecting sites for tunnels, dams and reservoirs

**UNIT - I**

Introduction: Importance of geology from Civil Engineering point of view, Case histories of failure of some Civil Engineering constructions, Importance of Physical geology, Petrology and Structural geology.

Weathering of Rocks: Its effect over the properties of rocks - importance of weathering.

**Learning Outcomes:**

At the end of this unit, the students will able to

- Understand the importance of various geological aspects in the field of Civil Engineering
- Acquire the knowledge of weathering on various types of Rocks

**UNIT - II**

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals.

Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks.

**Learning Outcomes:**

At the end of this unit, the students will able to

- Analyze the various minerals by using the physical identification
- Acquire the knowledge of various types of Rocks and their utilization in constructions

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**UNIT – III**

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults, unconformities, and joints.

Ground water: Ground water, Water table, common types of ground water, springs, cone of depression, zone of saturation, cone of depression, ground water exploration.

**Learning Outcomes:**

At the end of this unit, the students will able to

- Analyze the secondary structures present in the rocks
- Understand the formation and various stages of groundwater

**UNIT – IV**

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves. Landslides, their causes and effect;

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radio metric methods and geothermal method.

**Learning Outcomes:**

At the end of this unit, the students will able to

- Analyze the effects and causes of earthquakes and landslides in selecting the site for construction
- Study the various sub structures present below the surface without effecting the surface features by using geophysical investigations.

**UNIT – V**

Geology of Dams, Reservoirs, and Tunnels: Types of dams and Geological Considerations in the selection of a dam site. Geological factors influencing water Tightness and life of reservoirs. Tunnels - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (Lithological, structural and ground water).

**Learning Outcomes:**

At the end of this unit, the students will able to

- Apply the knowledge in selecting the location of site for the dams and reservoirs constructions.
- Analyze the role of groundwater, lithology and secondary structures in tunneling

**TEXT BOOKS:**

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications
5. Engineering Geology by Vasudev Kanithi, University Press.

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**REFERENCES:**

1. Fundamental of Engineering by F.G. Bell, B.S. Publications, 2005.
2. Principles of Engineering Geology & Geotechnics by Krynine & Judd, CBS Publishers
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers by P.C. Varghese , PHI

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# 2240128 - STRENGTH OF MATERIALS - II

**B. Tech. II Year II Sem** **L T P C**

**Pre-requisites**: Strength of Materials - I **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To understand the concepts of torsion and deflection of springs
2. To understand the behavior of columns and struts for various loading conditions
3. To calculate the direct and bending stresses of members subjected to various loads
4. To analyze the members for stability under sliding and overturning
5. To evaluate the hoop and radial stresses for thick and thin cylinders
6. To evaluate the stresses due to unsymmetrical bending and location of shear center

**Course Outcomes:** At the end of the course the student will able to

1. Apply the torsion theory for analysis of circular shafts and springs
2. Analyze columns and struts
3. Evaluate stresses in case of retaining walls, chimneys and dams and Analyze the structures under the conditions of sliding and overturning
4. Analyze the stress in Thin and thick cylinders.
5. Understand the concept of stresses & shear center for symmetrical and unsymmetrical Sections

**UNIT - I**

**Torsion of circular shafts:** Theory of pure torsion – Derivation of Torsion equation – Maximum torque transmitted by a circular solid shaft – Hollow circular shaft – Power transmitted by shafts - Polar section modulus – Combined bending and torsion – Design of shafts.

**Springs:** Types of springs – deflection of close and open coil helical springs under axial pull and axial couple – springs in series and parallel.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the behaviour of shafts subjected to torsion
- Design shafts for pure torsion and combined action of bending with torsion.
- Analyze and design open and closed coil helical springs.

**UNIT – II**

**Columns and struts:** Introduction – Failure of a column Assumptions End conditions for long column – Crushing load – Euler's formula - Equivalent length of a column – slenderness ratio – Limitation of Euler's formula - Long columns subjected to eccentric loading – Rankine's formula - Straight line formula – John's parabolic formula - Columns with eccentric load.

**Beam columns:** Laterally loaded struts subjected to uniformly distributed and concentrated loads.

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**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the types of column
- Analyze short and long columns subjected to axial load by various theories
- Analyze columns subjected to both axial load and lateral load

**UNIT – III**

**Direct and bending stresses:** Combined bending and direct Stresses – Column subjected to an Eccentric load - core of a section - determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability – Overturning and sliding – stresses due to direct loading and bending moment about both axis.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the behaviour of structures subjected to direct and bending stresses
- Evaluate the failure load for retaining walls, dams and chimneys.

**UNIT – IV**

**Thin cylinders:** Thin cylindrical shells subjected to internal pressure – Circumferential or hoop stress, longitudinal stresss – Efficiency of a joint – Effect of internal pressure on the dimensions of a thin cylindrical shell – Thin spherical shell – Change in dimensions of a thin spherical shell due to an internal pressure.

**Thick cylinders:** Stresses in a thick cylindrical shell – distribution of hoop and radial stresses across thickness – Stresses in compound thick cylinders.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyse and design thin and thick cylinders.
- Sketch the stress distribution across the section of thick cylinder

**UNIT – V**

**Unsymmetrical bending:** Introduction – Principal Moment of Inertia – Stress in Unsymmetrical bending – Deflection of beams in unsymmetrical bending – Method for finding bending stress in Unsymmetrical bending – Applications.

**Shear centre:** Shear centre – Shear centre for channel, Angle and I sections.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Evaluate bending stresses in members subjected to unsymmetrical bending
- Locate shear centre for a section.

**TEXT BOOKS:**

1. Strength of Materials by R. S. Khurmi, S. Chand Publications
2. Mechanics of Materials by Dr. B.C Punmia, Dr.Ashok Kumar Jain and Dr.Arun KumarJain
3. Strength of Materials by R. Subramanian, Oxford University Press
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.

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2. Strength of materials by S.S. Bhavikatti, Vikas Publishing house.
3. Strength of Materials by T.D. Gunneswara Rao and M. Andal, Cambridge Publishers
4. Strength of Materials (Part 1) by S. Timoshenko, CBS Publishers & Distributors.
5. Strength of Materials by B.S. Basavarajaiah and P. Mahadevappa, 3rdEdition, Universities Press

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# 2240129 – HYDRAULICS AND HYDRAULIC MACHINERY

**B. Tech. II Year II Sem** **L T P C**

**Pre-requisites**: Fluid Mechanics **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To define the fundamental principles of water conveyance in open channels.
2. To discuss and analyze the open channels in uniform and Non-uniform flow conditions.
3. To study the characteristics of hydroelectric power plant and its components.
4. To analyze and design of hydraulic machinery and its modeling

**Course Outcomes:** At the end of the course the student will able to

1. Apply knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
2. Analyse discharge in uniform, gradually and rapidly varied flows in open channel section
3. Apply dimensional analysis and Assess different hydraulic machinery devices and its principles utilized in hydropower development.
4. Evaluate the performance and efficiency of different types of turbines
5. Evaluate the characteristics of centrifugal pumps and estimation of hydropower potential.

**UNIT – I**

**OPEN CHANNEL FLOW – I**

Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient "n". Most economical sections. Computation of Uniform flow, Normal depth.

**Critical Flow:** Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

**Learning Outcomes:**

At the end of the unit, students should able to,

- Understand the uniform flow, turbulent flow in open channel and how to measure it
- Measure energy, critical depth

**UNIT – II**

**OPEN CHANNEL FLOW – II**

Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

**Rapidly varied flow:** Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

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**Learning Outcomes:**

At the end of the unit, students should able to,

- Understand the turbulent flow in open channel and how to measure it
- How the flow changed in to rapidly varied flow, and its character

**UNIT - III**

**DIMENSIONAL ANALYSIS AND HYDRAULIC SIMILITUDE:** Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – Dimensionless groups. Similitude, Model studies, Types of models.

Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

**BASICS OF TURBO MACHINERY:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular

**Learning Outcomes:**

At the end of the unit, students should able to,

- Do dimensional analysis
- Measure the work done and efficiency of vanes

**UNIT - IV**

**HYDRAULIC TURBINES – I:** Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

**HYDRAULIC TURBINES – II:** Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

**Learning Outcomes:**

At the end of the unit, students should able to,

- Understand the heads, efficiency of turbines
- Classification and working principles of turbines

**UNIT - V**

**CENTRIFUGAL PUMPS:** Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

**HYDROPOWER ENGINEERING:** Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

**Learning Outcomes:**

At the end of the unit, students should able to,

- Understand the concepts and working principles of pumps.
- Classification of hydropower plants and its operations

**TEXT BOOKS:**

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai &Co

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**REFERENCES:**


1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.).
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).
4. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
5. Hydraulic Machines by Banga & Sharma (Khanna Publishers).

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## 2240179 – FLUID MECHANICS AND HYDRAULIC MACHINERY LABOROTORY

| **B.Tech. II Year II Sem.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **Pre-requisites**: Fluid Mechanics, Hydraulics and Hydraulic machinery | **0** | **0** | **2** | **1** |

**Course Objectives:** The objective of the course is

1. To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
2. To explain the standard measurement techniques of fluid mechanics and their applications.
3. To illustrate the students with the components and working principles of the Hydraulic machines-different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. To analyze the laboratory measurements and to document the results in an appropriate format.

**Course Outcomes:** At the end of the course the student will able to

1. Understand the basic measurement techniques of fluid mechanics and its appropriate application.
2. Evaluate Coefficient of discharge for a small orifice by a constant head method
3. Analyse minor and major losses in pipe flow, energy loss in hydraulic jump
4. Evaluate Manning's and Chezy's constants for Open channel flow
5. Evaluate performance characteristics of hydraulic turbines and pumps

**List of Experiments:**

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Keplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

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# 2240180 – COMPUTER AIDED DRAFTING LABORATORY

| **B. Tech. II Year II Sem** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **Pre-requisites:** Engineering Drawing Practice | **0** | **0** | **2** | **1** |

**Course Objectives:** The objective of the course is

1. To teach the student usage of Auto cad, basic drawing fundamentals in various civil engineering applications, especially in building drawing.
2. To teach students the basic commands and tools necessary for professional 2D drawing, 3D drawing and drafting using AutoCAD
3. To sketch and take field dimensions.
4. To take data and transform it into graphic drawings.
5. To learn basic engineering drawing formats

**Course Outcomes:** At the end of the course the student will able to

1. Understand CAD software and basic functions
2. Apply CAD software to draw plans of Single storied and multi-storeyed buildings
3. Apply CAD software to draw plan, section and elevations of building
4. Apply CAD software to draw building components like doors, windows and roof trusses
5. Apply CAD software to draw single and multi-storeyed buildings using Auto CAD 3-D.

**List of Experiments**

1. Introduction to computer aided drafting & coordinate system.
2. Exercise on Draw & Modify tool bars.
3. Exercise on Layer, Dimension, Texting & Block etc.
4. Drawing a plan of Building and dimensioning using layers.
5. Drawing a plan, section and elevation of building (loan bearing structure)
6. Developing sections and elevations for given
   a) Single storied buildings b) Multi storied buildings. (Framed structure)
7. Drawing of building components like walls, lintels, Doors, and Windows.
8. Introduction to 3 – D view.
9. Creating single storey residential building in Auto CAD 3-D
10. Creating double storey residential building in Auto CAD 3-D

**TEXT BOOKS:**

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

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# III-I

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# 2250130 – WATER RESOURCES ENGINEERING

**B. Tech. III Year I Sem** **L T P C**

**Pre-requisites**: Fluid Mechanics & Hydraulics and Hydraulic Machinery **3 0 0 3**

**Course objectives:** The objective of the course is

1. To study occurrence movement and distribution of water
2. To know the estimation of hydrologic parameters like evaporation, infiltration
3. To understand the concept of unit hydrograph
4. To know the basic principles and movement of groundwater
5. To impart the knowledge of various irrigation techniques , requirements of the crops,
6. To learn about design of irrigation canals which are associated with sediment problem

**Course Outcomes:** At the end of the course the student will able to

1. Understand various components of hydrologic cycle
2. Evaluate various runoff measurements technique
3. Apply the concepts of movement of groundwater beneath the earth
4. Apply the knowledge of various irrigation techniques and Analyse the requirements of the crops
5. Design of irrigation canals.

**UNIT - I**

**HYDROLOGY**

Hydrologic cycle, types and forms of precipitation, rainfall measurement, computation of average rainfall over a basin, Adjustment of record, Rainfall Double Mass Curve. Evaporation, factors affecting evaporation, measurement of evaporation- Evapotranspiration estimation Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understanding of hydrology and its application in varied areas of civil engineering
- Illustrate the methods measuring rainfall
- Interpret the rainfall over a drainage basin
- Explain the need of measuring the abstractions
- Assess the losses from rainfall

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**UNIT - II**

**HYDROGRAPHS**

Distribution of Runoff - Factors affecting Runoff - Rational Formulae.

Hydrograph Analysis Flood Hydrography - Effective Rainfall - Base Flow - Base Flow Separation - Direct Runoff Hydrograph - Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the runoff cycle
- Interpret the discharge over a basin using hydrographs
- Explain the concept of s-hydrograph
- Assess the runoff from ungauged basin using synthetic unit hydrograph
- Apply the unit hydrograph theory in flood estimation

**UNIT - III**

**GROUNDWATER**

Groundwater Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivitty and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of well's, Well Construction - Well Development.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the movement of groundwater
- Explain the groundwater properties that cause flow
- Assess the groundwater properties
- Interpret the flow of water through different subsurface layers
- Understand the well construction and development techniques

**UNIT - IV**

**IRRIGATION**

Necessity and Importance of Irrigation, ill effects of irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility - Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, Duty and delta, factors affecting duty- Depth and frequency of Irrigation, irrigation requirements and efficiencies-Water Logging.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the need of irrigation in India
- Illustrate different methods of irrigation

- Establish the relation between soil-water-plant
- Assess the duty and delta for crop
- Design the required discharge for crop

**UNIT - V CANALS**

Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standard for a canal design, canal lining.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the irrigation canals
- Understand the importance of silt in canal design
- Design the irrigation canals using silt concept
- Illustrate the lining materials
- Apply the silt theories in canal design

**TEXT BOOKS:**

1. Engineering hydrology by Jayram Reddy, Laxmi publications pvt. Ltd., New Delhi.
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi.

**REFERENCES:**

1. Elementary hydrology by V. P. Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House.
3. Water Resources Engineering - I by Dr. G. Venkata Ramana, Acadamic Publishing Company.
4. Irrigation Water Management by D. K. Manjundar, Printice Hall of India.
5. Irrigation and Hydraulic structures by S. K. Grag.
6. Applied hydrology by Ven Te Chow, David R. Maidment larry W. Mays Tata Mc. Graw Hill.
7. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI.

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# 2250131 - BASIC STRUCTURAL ANALYSIS

**B. Tech. III Year I Sem** **L T P C**

**Pre-requisites**: Strength of Materials I & II **3 1 0 4**

**Course Objectives:** The objective of the course is

1. To differentiate the statically determinate and indeterminate structures, analyse the propped cantilever and fixed beams
2. To Analyse the pin jointed plane frames under different loading positions.
3. To understand the energy methods used to derive the equations to solve engineering problems
4. To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
5. To Analyse the statically indeterminate members such as continuous beams and for various types of loading by slope deflection, moment distribution method and theorem of three moments method.
6. To evaluate the Influence on a beam for different static & moving loading positions

**Course Outcomes:** At the end of the course the student will able to

1. Analyse propped cantilever and fixed beams
2. Analyse the pin jointed plane frames
3. Evaluate the normal thrust, radial shear, bending moment of three hinged arch.
4. Analyse the beams and frames using slope and deflection, moment distribution and theorem of three moments method
5. Evaluate the structure under moving loads and draw the Influence line diagram

**UNIT - I**

**PROPPED CANTILEVER AND FIXED BEAMS**

Static and kinematic indeterminacies for beams - Analysis of Propped cantilever and fixed beams subjected to different types of loads - Deflection of Propped cantilever and fixed beams - effect of sinking of support. Elastic curve.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the difference between static and kinematic indeterminacy, slope and deflection for various support conditions corresponding to different types of loads.
- Analyse the propped cantilever beam for different loading condition and draw the SFD and BMD. Also to find the maximum deflection of beam.
- Analyse the fixed beam for different loading condition and draw the SFD and BMD. Also to find the maximum deflection of beam.

**UNIT - II**

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**THEOREM OF THREE MOMENTS AND ANALYSIS OF TRUSSES**

Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams. Types of trusses – Perfect, Imperfect and Redundant pin jointed plane frames – Determinate trusses- Method of joints, method of sections and tension coefficient method for determinate perfect pin jointed plane frames subjected to vertical loads, horizontal loads and inclined loads.

**Learning Outcomes:**

At the end of the unit, students should able to

- Know the theorem of three moments to solve continuous beams and know the types of trusses and its behaviour for different loading position.
- Analyse the continuous beam and draw the SFD and BMD for the continuous beam for different loading, end conditions.
- Analyse the trusses using the method of joints, section and tension coefficient for different loading positions.

**UNIT - III**

**ENERGY THEOREMS AND THREE HINGED ARCHES**

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.

Three Hinged Arches: Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

**Learning Outcomes:**

At the end of the unit, students should able to

- Know the different types of arches, determinate and indeterminate arches, cables and its behaviour for different loading condition and can able to draw the BMD.
- Perform the calculation to analyse the three hinged arches for various loading condition and find the maximum bending moment, radial shear and horizontal thrust.

**UNIT - IV**

**SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD**

Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

Moment Distribution Method and its application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the concepts behind the analysis of beam using slope deflection and moment distribution method.
- Analyse the continuous beam for different loading condition and draw the SFD and BMD using

slope deflection method.

- Analyse the continuous beam for different loading condition and draw the SFD and BMD using moment distribution method.

**UNIT – V**

**MOVING LOADS AND INFLUENCE LINES**

Introduction - maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load, uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load.

Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

**Learning Outcomes:**

At the end of the unit, students should able to

- Know the concepts and application of influence lines and its different classification.
- Perform the calculation for moving loads using influence lines and draw the SFD and BMD
- Analyse the beam for different conditions of moving loads.

**TEXT BOOKS:**

1. Basic Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
2. Indeterminate Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
3. Analysis of Structures, Vol & II, Vazirani.V.N and Ratwani, M.M, Khanna Publishers, 2015.
4. Structural Analysis Vol I & II by G.S.Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt. Ltd. 2008
5. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.
6. R. Vaidyanathan & P. Perumal, Structural Analysis Vol I & II, (Fourth Edition), Laxmi Publications, New Delhi, 2016.

**REFERENCES:**

1. William Weaver, J and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Delhi,1995
2. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
3. Reddy.C.S, “Basic Structural Analysis”,Tata McGraw Hill Publishing Company,2005.
4. Rajasekaran. S, & G. Sankarasubramanian., “Computational Structural Mechanics”, PHI Learning Pvt. Ltd, 2015
5. Negi L.S.and Jangid R.S.,Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2004.
6. Structural analysis T. S Thandavamoorthy, Oxford university Press, 2011

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# 2250132 - DESIGN OF REINFORCED CONCRETE ELEMENTS

**B. Tech. III Year I Sem** **L T P C**

**Pre-requisites**: Building Materials, Strength of Materials I & II and Basic structural analysis **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To discuss the fundamentals of reinforced concrete structural properties and behaviours.
2. To state the optimum design criteria and procedures.
3. To explain the basic principles and design methods of reinforced concrete members.
4. To clarify code requirements and specifications and explain the background of code.
5. To outline professional and contemporary issues in the design and fabrication of reinforced concrete members.
6. To sketch reinforcement details of reinforced concrete members.

**Course Outcomes:** At the end of the course the student will able to

1. Understand the concept of methods of design, also design of slab and beam by working stress method.
2. Design of singly and doubly reinforced concrete beam
3. Understand the concept of bond, design of shear and torsional reinforcement.
4. Design of slab.
5. Design of columns and footings.

**UNIT - I**

**INTRODUCTION: CONCEPT OF REINFORCED CEMENT CONCRETE**

Introduction IS: 456-2000, Materials & other properties, compressive strength, tensile strength, creep, shrinkage, Elastic Deformation, Suitability of steel in concrete, stress-strain relation of steel, Methods of design, Design of slab and beam by Working stress method.

**Learning Outcomes:**

At the end of the unit, student should able to,

- To get familiar with IS:456-2000 code
- Understand the properties of concrete and steel
- Understand the concept of RCC
- To know the methods of RCC design

**UNIT - II**

**DESIGN OF BEAMS**

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Loads and Load Combinations, safety factors- Limit State method, Limit State of Collapse **Singly Reinforced Concrete Beams** - Stress Block Parameters, limiting depth of neutral axis, Ultimate moment of resistance. Under reinforced, Balanced & Over reinforced sections.

**Doubly Reinforced Concrete Beams:** Doubly reinforced concrete beam and its necessity, Design of a doubly reinforced concrete beam, Design of L and T-beams. Economical depth – Detailing of reinforcement

**Learning Outcomes:**
At the end of the unit, student should able to,

- Understand and implement the load calculations for different conditions.
- Analyse and Design RCC beams for different loading conditions.
- Calculate the bearing capacity of slab beam combo in flanged beams.

**UNIT - III**
**BOND, SHEAR AND TORSION**
Concept of bond, Permissible bond stresses for plain and deformed bars as per BIS code of practice, minimum length, and standard hook.
Design of shear using IS:456-2000, Design of stirrups
Design of shear using IS:456-2000, Design of Torsional Reinforcement

**Learning Outcomes:**
At the end of the unit, student should able to,

- Analyse the importance and bond between concrete and steel in RCC
- Implement the codal provisions for bond, shear and torsion in design
- Design beams for all loading conditions

**UNIT - IV**
**DESIGN OF SLABS**
Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using IS Method - Detailing of reinforcement , Limit state design for serviceability for deflection, cracking and codal provisions

**Learning Outcomes:**
At the end of the unit, student should able to,

- Understand the concept of slab
- To be able to distinguish between different varieties of slab and loading conditions
- Introduce to limit state of serviceability

**UNIT - V**
**DESIGN OF COLUMNS AND FOOTINGS**
Short Column - Columns with axial loads, uniaxial and bi-axial bending – Use of design charts- Long column – Design of long columns - IS Code provisions

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Different types of footings –Design of flat isolated square, rectangular, circular footings and combined footings for two columns – Detailing of reinforcement.

**Learning Outcomes:**

At the end of the unit, student should able to

- Design of Columns
- Understand the codal provisions and load combinations on members
- Implement RCC concepts to analyse and design foundations

**TEXT BOOKS:**

1. Dr. B.C. Punmia and A.K.Jain, “Limit State Design of Reinforced Concrete”, Lakshmi Publication, 2007.
2. Dr. H.J. Shah, “Reinforced Concrete (Elementary Reinforced Concrete), Charotar Publishing House Pvt. Ltd., 11th Edition.
3. P.C. Varghese, “Limit State Design of Reinforced Concrete”, Prentice Hall of India Pvt Ltd, New Delhi.

**REFERENCES:**

1. S. Unnikrishnan Pillai and Devdas Menon, “Reinforced Concrete Design”, McGraw HillEducation, 3rd Edition.
2. M.L. Gambhir, “Fundamentals of Reinforced Concrete Design” PHI Learning Edition, 2012.
3. Arthus H. Nilson, David Darwin and Chorles W. Dolar, “Design of Concrete Structures”,Tata McGraw Hill, 2011.
4. S.S.Bhavikatti, “Design of RCC Structural Elements” :Vol-1, New Age Publishers, 2008.

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# 2250141 - CONCRETE TECHNOLOGY
## (Professional Elective – I)

**B. Tech. III Year I Sem** **L T P C**

**Pre-Requisites:** Building Materials, Construction and Planning **3 0 0 3**

**Course Objectives**: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.

**Course Outcomes**: At the end of the course the student will able to

1. Determine the properties of concrete ingredients such as cement, sand, coarse aggregate by conducting different tests.
2. Classify and test on aggregate.
3. Understand the different workability and strength tests.
4. Apply advanced laboratory techniques to characterize cement-based materials.
5. Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fiber reinforced concrete.

**UNIT - I**

Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the different types of cement, grades and their physical properties
- Understand the different types of admixtures

**UNIT - II**

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

**Learning Outcomes:**

At the end of the unit, student should able to


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- Understand the different types of aggregates and tests on those aggregate to find their physical and thermal properties.

**UNIT - III**

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and re-vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the term workability of concrete
- Explain the different tests on workability of concrete
- Know the effect of excess water, vibration in quality of concrete

**UNIT - IV**

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing. Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the term hardened concrete, their properties and the different test to find its strength
- Know the different NDT tests and their procedure to find the strength of concrete as per code.

**UNIT - V**

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design. Special Concretes: Introduction to light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

**Learning Outcomes:**

At the end of the unit, student should able to

- Write the mix design as per codes
- Understand the different types of special concrete and to know the procedure to make it.

**TEXT BOOKS:**

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004

2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

**REFERENCES:**

1. Properties of Concrete by A. M. Neville, 5th edition, Pearson Publishers, 2012.
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers
3. IS:10262-2019, Concrete Mix Proportioning — Guidelines (Second Revision), BIS, New Delhi
4. IS:516-2021, Hardened concrete – Method of Test, Part-1 Testing of strength of concrete, BIS, New Delhi.
5. IS:516-2018, Hardened concrete – Method of Test, Part-2 Properties of Hardened Concrete other than Strength, BIS, New Delhi
6. IS:516-2018, Hardened concrete – Method of Test, Part-4 Sampling, Preparing and Testing of concrete cores, BIS, New Delhi
7. IS:516-2018, Hardened concrete – Method of Test, Part-5 Non Destructive Testing of concrete, BIS, New Delhi
8. IS:516-2018, Hardened concrete – Method of Test, Part-8 Determination of modulus of elasticity, BIS, New Delhi

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# 2250142 – STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

## (Professional Elective – I)

| **B. Tech. III Year I Sem** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **Pre-Requisites: Engineering Geology, Structural Analysis** | **3** | **0** | **0** | **3** |

**Course Objectives**: The objective of the course is

1. To understand Engineering Seismology
2. To explain and discuss single degree of freedom systems subjected to free and forced vibrations
3. To acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
4. To understand importance of ductile detailing of RC structures

**Course Outcomes**: At the end of the course the student will able to

1. Derive fundamental equations in structural dynamics
2. Explain causes and Theories on earthquake, seismic waves, measurement of earthquakes
3. Evaluate base shear using IS methods
4. Analyse masonry structures subjected to earthquake forces
5. Analysis of non structural element and ductility design of concrete structures

**UNIT - I**

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonics Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales Energy Released-Earthquake measuring instruments seismogram - Seismoscope, Seismograph, - strong ground motions- Seismic zones of India.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the theory of vibrations
- Know the different types of vibrations
- Derive the equations of theory of vibrations
- Explain the causes of earth quake and the theory to measure the earth quake.

**UNIT - II**

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of

buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the concept on seismic design of structure
- Explain the different methods to analyse the seismic parameters

**UNIT - III**

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings - Seismic methods of analysis- IS code based methods for seismic design - Vertical irregularities - Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the different methods to design the RCC building with seismic constraints as per code.
- Determine the lateral forces as per IS codes

**UNIT - IV**

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the different methods to design the masonry building with seismic constraints
- Determine the behaviour of masonry building under seismic forces
- To find the load combinations and lateral load behaviour

**UNIT - V**

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of nonstructures- Effects of non-structural elements on structural system- Analysis of non-structural elements Prevention of non-structural damage Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 - Behaviour of beams, columns and joints in RC buildings during earthquakes.

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**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the difference between structural and non structural wall and their behaviour under seismic forces.
- Determine the behaviour of wall under lateral forces

**TEXT BOOKS:**

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

**REFERENCES:**

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Buidling structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design – Anand S.Arya, Nem chand & Bros.
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy
6. BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:2000.

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# 2250143 - PREFABRICATED STRUCTURES

## (Professional Elective – I)

**B. Tech. III Year I Sem** **L T P C**

**Pre-Requisites:** Structural Engineering (I&II) **3 0 0 3**

**Course Objectives**: The objective of the course is

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

**Course Outcomes:** At the end of the course the student will able to

1. Understand the principle & procedure of prefabrication
2. Design the structural prefabricated elements and Familiarize with joining techniques used for prefabrication
3. Understand the manufacturing technology adopted
4. Identify the different techniques for hoisting
5. Design considering abnormal loads which are hazardous to the prefabricated structures.

**UNIT - I**

**GENERAL PRINCIPLES OF FABRICATION**

Types of prefabrication – site and plant prefabrication -Economy of prefabrication – Modular coordination – Standardization- Disuniting of Prefabricates, production, transportation, erection, stages of loading – Applications of Prefabrication.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the principles of prefabrication and
- Explain the different types fabrication and applications of prefabrication

**UNIT - II**

**PREFABRICATED COMPONENTS**

Behaviour of structural components - Roof and floor panels- wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing- Columns – Shear walls

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the behaviour of different structural components
- Explain the connections of different components

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**UNIT - III**

**MANUFACTURING TECHNOLOGY**

Manufacturing methods – Stationary and mobile production- Storage of precast elements - Dimensional tolerances

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the concepts of manufacturing methods of prefabrication
- Illustrate the different methods of manufacturing

**UNIT - IV**

**HOISTING TECHNOLOGY**

Equipments for hoisting and erection – Techniques for erection of different types of members like Slabs, Beams, Wall panels and Columns – Advanced techniques - Vacuum lifting pads.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the principles of hoisting technology and
- Explain the different erection methods

**UNIT - V**

**DESIGN FOR ABNORMAL LOADS**

Progressive collapse-Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., Importance of avoidance of progressive collapse.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the term abnormal loads
- Design concepts for the member under abnormal loads

**TEXT BOOKS:**

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

**REFERENCES:**

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

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# 2250144 - INTRODUCTION TO OFFSHORE STRUCTURES

## (Professional Elective – I)

**B. Tech. III Year I Sem** **L T P C**

**Pre-Requisites:-** **3 0 0 3**

**Course Objectives**: The objective of the course is

1. To understand the importance and functions of Offshore structure
2. To know the materials used in marine environment
3. To Know the Installation Methods of Offshore Structures

**Course Outcomes:** At the end of the course the student will able to

1. understand the functions of Offshore Structures
2. Understand about the materials used for marine structures
3. Analyse the different loads on Offshore Structures and basic design of Offshore structures
4. Apply mooring system, industry standards and rules
5. Understand installation method of Offshore Structures

**UNIT - I**

Introduction to Offshore Structures - Functions of Offshore Structures - Offshore Structure Configurations - Bottom Supported Fixed Structures - Compliant Structures - Floating Structures.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand about offshore structure and its functions
- Illustrate about different types of offshore structure

**UNIT - II**

Materials for Marine Environment - Structural Steel Topside Materials - Advanced Composite materials - Corrosion Control Material - Reliability and Monitoring - Fracture Control.

**Learning Outcomes:**

At the end of the unit, student should able to

- Communicate the materials used for offshore structure and
- Interpret the composite materials used

**UNIT - III**

Loads on offshore Structures - Gravity Loads, Hydrostatic Loads - Resistance Loads, Current loads on Structures - Current Drag and Lift Force, Steady, Dynamic and Wind Loads on Structures - Wave Loads on Structures - Varying Wind Load - Impulse loads - Introduction to design.

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**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the different loads on offshore structure and
- Applying the design concepts as per codes

**UNIT - IV**

Mooring - General layout Areas and Equipment - Helideck Platform Crane Mooring systems : Mooring Hardware components

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the term and concepts of mooring on offshore structure and
- Explain the operations of different equipments and techniques used in mooring

**UNIT - V**

Installation Methods of Offshore Structures - Platform Installation Methods: Fixed Platform Substructures - Floating Structures Foundations Subsea Templates.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the different methods of installation of offshore structure and
- Explain the procedures of the different installation methods.

**TEXT BOOKS:**

1. Reddy, D.V & Arockiasamy, M., Offshore Structures Vol.1 & 2, Kreiger Publ. Co.1991.
2. Graff, W.J., Introduction to Offshore Structures, Gulf Publ.Co.1981.

**REFERENCES:**

1. Morgan, N., Marine Technology, Butter worths, 1990.
2. Dawson, T.H., Offshore Structural Engineering, Prentice Hall, 1983.
3. B.C Gerwick, Jr. Construction of Marine and Offshore Structures, CRC Press, Florida, 2000.

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# 2250101 – AIR AND NOISE POLLUTION CONTROL

## (Open Elective – I)

**B. Tech. III Year I Sem** **L T P C**

**Prerequisites:-** **3 0 0 3**

**Course Objective**

To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

**Course Outcomes:** At the end of the course, the students will be able to:

1. Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. Identify meteorological aspects of air pollution dispersion
3. Determine the ambient air quality and identify, formulate and solve air and noise pollution problems
4. Understand to Control gaseous contaminants
5. Identify and control noise pollution

**UNIT - I**

Air pollution: composition and structure of atmosphere, global implications of air pollution. Classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

**Learning Outcomes:**

At the end of the unit, student should able to

- Why the air pollution has been occurring
- What are all the compositions and pollutants causes air pollution.
- Understand the effects of air pollution

**UNIT - II**

Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the chemistry and metrological aspects of air pollution
- Explain the parameters of chemistry and metrological aspects of air pollution

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**UNIT - III**

Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand that what are all the standards, measurements and control devices available for the ambient air quality
- Illustrate the different devices used for controlling the contaminants.

**UNIT - IV**

Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

**Learning Outcomes:**

At the end of the unit, student should able to

- Understand the term gaseous contaminants and
- Explain the different methods available to control the gaseous contaminants

**UNIT - V**

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

**Learning Outcomes:**

At the end of the unit, student able to

- Understand the causes for noise pollution
- List the methods and materials available for basic acoustics
- Measure the sound specification by different devices and methods

**TEXT BOOKS:**

1. Rao C.S., Environmental Pollution Control Engineering, New Age International editors and publishers, 3rd Edition, 2018.
2. Rao M.N. and Rao H.V.N., Air Pollution Control, Tata McGraw Hill, 2014.
3. S.P. Singal, Air Quality Monitoring and Control Strategy, Narosa Publishing House Pvt. Ltd., 2012.

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**REFERENCES:**

1. Cunniff P.F., Environmental Noise Pollution, John Wiley & Sons, 2014.
2. Anjaneyalu Y, Air Pollution and Control Technologies, Allied Publishers, 2011.
3. Khopkar S M., Environmental Pollution Monitoring and Control, New Age International editors and publishers, 2018.
4. Lawrence K Wang, Norman C. Pereria, Hand Book of Environmental Engineering, Advanced Air and Noise Pollution Control, Humana Press Inc. 2018.

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# 2250181 - CONCRETE TECHNOLOGY LABORATORY

**B. Tech. III Year I Sem** **L T P C**

**Prerequisites:** Building Materials, Construction and Planning **0 0 2 1**

**Course Objectives:** The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.
4. To understand the different properties of materials and different types of procedures adopted for mix design
5. To apply the learning for research work.
6. To summarize the concept of workability and testing of hardened concrete.

**Course Outcomes:** At the end of the course the student will able to

1. Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests.
2. Recognize the effects of the theology and early age properties of concrete on its long-term behaviour.
3. Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties and Use advanced laboratory techniques to characterize cement-based materials.
4. Perform mix design for a given set of conditions.
5. Understand engineering properties of special concretes such as high performance concrete, self-compacting concrete, and fibre reinforced concrete.

**I. TEST ON CEMENT**

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement.
5. Compressive strength of cement.

**Learning Outcomes:**

At the end of the tests, student should able to

- List the different tests available to find the properties of cement
- Explain the procedure to do the tests on cements as per codes

**II. TEST ON AGGREGATE**

1. Sieve Analysis and gradation zone
2. Bulking of sand.

3. Bulk and compact densities of fine and coarse aggregates

**Learning Outcomes:**
At the end of the tests, student should able to

- List the different tests available to find the properties of aggregates
- Explain the procedure to do the tests on aggregates as per codes

**III. TEST ON FRESH CONCRETE**

1. Slump test
2. Compaction factor test
3. Vee-bee Test
4. Flow table Test.

**Self-Compacting Concrete**

1. Slump cone
2. V funnel
3. L Box

**Learning Outcomes:**
At the end of the tests, student should able to

- Understand what is fresh concrete and self compacting concrete
- List the different tests available to find the properties of fresh and self compacting concrete
- Explain the procedure to do the tests on fresh and self compacting concrete

**IV. TEST ON HARDENED CONCRETE**

1. Compression test on cubes & cylinders
2. Flexure test
3. Splitting Tensile Test
4. Modulus of Elasticity

**Learning Outcomes:**
At the end of the tests, student able to

- Understand that what is hardened concrete
- List the different tests available to find the properties of hardened concrete
- Explain the procedure to do the tests on hardened concrete

**V. NON DESTRUCTIVE TEST OF CONCRETE**

1. Rebound hammer
2. Ultrasound pulse Velocity (UPV).

**Learning Outcomes:**
At the end of the tests, student should able to

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- Understand that what is NDT
- Know the different equipments used to NDT
- Explain the procedure to do the tests using NDT

**TEXT BOOKS:**

1. Concrete Technology by M.S. Shetty – S. Chand & Co.
2. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons.

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# 2250182 - COMPUTER AIDED DESIGN AND DETAILING LABORATORY

## B.Tech. III Year I Sem

**L T P C**

**0 0 2 1**

**Prerequisites:** Computer Aided Civil Engineering Drawing or Auto CAD Principles, Design of Reinforced Concrete Elements and design of steel structures

**Course Objectives:** The objectives of the course are to

1. Design and detailing of structural elements using CAD.

**Course Outcomes:** At the end of the course, the students will be able to:

1. Design and detailing of T beam and slab floor system.
2. Design and detailing of columns, footing and water tanks.
3. Design and detailing of retaining wall and staircases.
4. Design and detailing of structural connections
5. Design and detailing of flexural members, plate girder, steel columns, column base and foundations.

**LIST OF EXPERIMENTS**

Design and detailing of reinforced concrete structures and Steel structures using IS codes:

**Reinforced Concrete Structures**

1. Design and detailing of reinforced concrete T-beam and slab-floor system
2. Design and detailing of columns and footings
3. Design and detailing of water tanks
4. Design and detailing of retaining walls
5. Design and detailing of staircases

**Steel Structures**

6. Design and detailing of structural connections
7. Design and detailing of flexural members
8. Design and detailing of plate girder
9. Design and detailing of steel columns
10. Design and detailing of column base and foundations

**Learning Outcomes:**

At the end of the tests, student able to

- Design and detailing of different components of RCC structure using CAD software.
- Design and Detailing of different components of steel structure using CAD software.

**TEXT BOOKS:**

1. Structural design and drawing (Reinforced Concrete and steel) by N Krishna Raju. Third Edition.

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# 2250183 - DESIGN AND DRAWING OF IRRIGATION STRUCTURES

**B. Tech. III Year I Sem** **L T P C**

**Pre-requisites**: - **0 0 2 1**

**Course Objectives:** The objective of the course is to

Learn designing and drawing of hydraulic structure like surplus weir, siphon well drop, trapezoidal notch fall, tank sluice with tower head.

**Course Outcomes:** At the end of the course the student will able to

1. Design and drawing of Surplus weir and Syphon Well Drop
2. Design and drawing of Trapezoidal notch fall and Tank sluice with tower head
3. Design and drawing of Sloping glacis weir
4. Design and drawing of canal regulator and under tunnel.
5. Design and drawing of Syphon aqueduct

**List of Experiments**

Design and drawing of the following hydraulic structures.

Group A

1. Surplus weir.
2. Syphon Well Drop
3. Trapezoidal notch fall.
4. Tank sluice with tower head

Group B

1. Sloping glacis weir.
2. Canal regulator
3. Under Tunnel.
4. Type III Syphon aqueduct

**TEXT BOOKS:**

1. Water Resources Engineering – Principles and Practice by Challa Satyanarayana Murthy, New Age International Publishers.

2. Irrigation engineering and Hydraulic structures by S. K. Garg, Standard Book House. by G. L. Asla

3. Irrigation and Water Resource Engineering by G.L. Asawa New Age International Publishers -2013

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# III-II

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# 2260133 – DESIGN OF STEEL STRUCTURES

**B. Tech. III Year II Sem** **L T P C**

**Prerequisites**: Structural Engineering -1 (RCC) **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To learn about the basics of steel sections and their prominence in constructions.
2. To impart knowledge on different types of connections
3. To learn about the design of beams.
4. To learn about design of tension and compression member.
5. To learn about design of lacings and battens.
6. To learn about design of roof truss and purlin.

**Course Outcomes:** At the end of the course the student will able to

1. Design bolted and welded connections
2. Design laterally supported and unsupported beams and also design of plate girder.
3. Design tension member and design compression member
4. Design lacings and battens.
5. Design roof trusses and purlin.

**UNIT - I**

Introduction: Introduction to steel structures, merits and demerits

Bolted Connections: Introduction, advantages and disadvantages of bolting, General terminology, Types of bolts - Strength of bolts, design of bolted connection

Welded Connections: Introduction, advantages and disadvantages of welding, Strength of welds, Butt and fillet weld; Design of welded connections.

**Learning Outcomes:**

At the end of the unit, students will be able to understand

- Basics of steel, its properties, merits and demerits.
- Design of bolted and welded connections.

**UNIT - II**

**Laterally Supported Beams**: Design of laterally supported beam.

**Laterally Unsupported Beams**: Design of laterally unsupported beams.

**Plate Girder:** Design of plate girder

**Learning Outcomes:**

At the end of the unit, students will be able to,

- Design of laterally supported beams.
- Design of laterally unsupported beams.

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**UNIT - III**

**Tension Members**: General Design of members subjected to direct tension and bending, effective length of columns; Slenderness ratio, permissible stresses.

**Compression Members**: Design of axially loaded compression members, struts; eccentrically loaded columns.

**Learning Outcomes:**

At the end of the unit, students will be able to,

- Design of tension member.
- Design of compression member.

**UNIT - IV**

**Design of Lacings**: Design principles as per IS Code. Design of single and double lacing system using bolting for channel and angle sections.

**Design of Battens**: Design principles and specifications as per IS Code. Design of batten systems using bolting for channel and angle sections.

**Learning Outcomes:**

At the end of the unit, students will be able to,

- Design of Lacing.
- Design of Battens.

**UNIT - V**

**Roof Truss:** Types of Trusses, Loads on trusses, Design of roof trusses

**Purlin:** Design of purlin

**Learning Outcomes:**

At the end of the unit, students will be able to,

- Design of roof trusses.
- Design of purlins.

**TEXT BOOKS**:

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
2. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

**REFERENCES:**

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013.
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel


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Publications, 2002.
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800,2007 Structures Publications, 2009.
5. IS 800:2007, General Construction In Steel, Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007.

**CODES/TABLES:**

IS: CODES-STEEL TABLES:

1. IS - 800, 2007
2. IS - 875, Part III
3. Steel Tables.
4. IS 1367 (Part 3)

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# 2260134 – SOIL MECHANICS

**B. Tech. III Year II Sem** **L T P C**

**Pre-requisites**:- **3 0 0 3**

**Course Objective:** The objective of the course is

1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
2. To familiarize the students about the fundamental concepts of compaction,
3. Understand the flow through soil, stress transformation,
4. Analyse stress distribution, consolidation in soil
5. Understand shear strength of soils.
6. To impart knowledge of design of both finite and infinite slopes.

**Course Outcomes:** At the end of the course the student will able to

1. Classify the soil and assess the engineering properties, based on index properties.
2. Understand the stress concepts in soils
3. Understand and identify the consolidation settlements in soils.
4. Determine the shear strength of soil
5. Analyse finite and infinite slopes.

**UNIT - I**

**SOIL CLASSIFICATION AND COMPACTION**

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship –Compaction theory – laboratory and field technology – field Compaction method – factors influencing compaction.

**Learning Outcome:**

At the end of the unit, students should able to,

- Classify the different types of soils
- Understand the structural arrangement of soils
- Assess the engineering properties of soils
- Understand the concept of compaction of soil
- Apply the concepts in the field.

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**UNIT - II**

**EFFECTIVE STRESS AND PERMEABILITY**

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Permeability – Factors influencing permeability of soils -Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods)

**Learning Outcome:**

At the end of the unit, students should able to,

- Understand the relationship between soil and water
- Interpret the stresses in soils
- Understand the concept of flow through different soils
- Evaluate the flow parameters using darcys law
- Identify the factors influencing permeability of soils.

**UNIT - III**

**STRESS DISTRIBUTION AND SETTLEMENT**

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and UDL) Use of New marks influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory

**Learning Outcome:**

At the end of the unit, students should able to,

- Understand the concept of stress distribution and settlement
- Explain the Boussines theory
- Use the new marks influence chart
- Identify the components of settlement
- Understand the Terzaghi's one dimensional consolidation theory

**UNIT - IV**

**SHEAR STRENGTH**

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory - Pore pressure parameters - Factors influences shear strength of soil-– shear strength - Direct shear, Triaxial compression, Unconfined compression test and Vane shear test.

**Learning Outcome:**

At the end of the unit, students should able to,

- Understand the concept of shear strength of soils
- Explain the Mohr-Coulomb failure theory
- Identify the factors influencing permeability of soils.
- Assess the of shear strength of soils
- Evaluate the shear strength of soils using different equipments

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**UNIT - V**

**SLOPE STABILITY**

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c - ϕ soil – Slope protection measures.

**Learning Outcome:**

At the end of the unit, students should able to,

- Classify the types of slopes
- Understand the Friction circle method
- Use the stability number for slop analysis
- Identify the location of critical slope in different conditions
- Enlighten the slope protection measures

**TEXT BOOKS:**


1. Murthy, V.N.S., “Text book of Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., New Delhi.2014
2. Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, “Basic and Applied Soil Mechanics” New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. NewDelhi, 16th Edition, 2017.
5. T.N. Ramamurthy and T.G. Sitharam, “ Geotechnical Engineering”, S. Chand Publishing, New delhi 2015.


**REFERENCES:**


1. Muni budhu, “ Soil Mechanics and Foundations”, John wiley & sons,INC.3rd Edition,
2. McCarthy, D.F., “Essentials of Soil Mechanics and Foundations: Basic Geotechnics”. Prentice-Hall,2006.
3. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
4. Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India Private Limited, 8th Edition, 2014.
5. Palanikumar.M., “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi,2013.
6. Venkatramaiah.C., “Geotechnical Engineering”, New Age International Pvt. Ltd., New Delhi, 2017.
7. Purushothama Raj. P., “Soil Mechanics and Foundations Engineering”,2nd Edition, Pearson Education, 2013.

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# 2260017 – FUNDAMENTALS OF MANAGEMENT

**B.Tech. III Year II Sem** **L T P C**

**Prerequisites: -** **3 0 0 3**

**Course Objectives:** To understand the management concepts, applications of concepts in practical aspects of business and development of managerial Skills.

**Course Outcomes**: At the end of the course the students will be able to

1. Understand the significance of management in their profession
2. Understand the various forms of organization and HRM, leadership and motivation theories, controlling procedure.
3. The students can explore the management practices in their domain area.

**UNIT – I Introduction to Management**

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The behavioural approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

**UNIT – II Planning and Decision Making**

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

**UNIT - III Organizations and HRM**

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

**UNIT – IV Leading and Motivation**

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Leadership. Motivation - Types of Motivation;


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Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

**UNIT – V Controlling**

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non-Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

**TEXT BOOKS:**

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

**REFERENCES:**

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

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# 2260145 – INDETERMINATE STRUCTURAL ANALYSIS

## (Professional Elective – II)

**B. Tech. III Year II Sem** **L T P C**

**Pre-requisites**: Structural Analysis - I **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To understand the concepts and principles of analysis, calculate and draw the variation of shear force and bending moment of the structure
2. To analyse the indeterminate arches.
3. To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses.
4. To apply the concepts of matrix analysis for different beams, frames and truss
5. To learn and apply the knowledge of Plastic analysis on beams and rigid frames.

**Course Outcomes:** At the end of the course the student will able to

1. Analyse the indeterminate frames with and without sway by slope deflection and moment distribution method.
2. Analyse the different types of indeterminate arches.
3. Understand the concepts of Muller Breslau principle and draw the influence lines for statically indeterminate beams also draw the shear force diagram and bending moment diagram for various loading condition
4. Understand and apply the knowledge of stiffness method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
5. Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames

**UNIT - I**

**SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD**

Slope Deflection Method: Analysis of Single Bay – single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams.

Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames including side Sway.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the concepts behind the analysis of rigid using slope deflection and moment distribution method.
- Analyse the indeterminate frame for different loading condition and draw the SFD and BMD using slope deflection method.
- Analyse the indeterminate frame for different loading condition and draw the SFD and BMD using moment distribution method.

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**UNIT - II**

**ARCHES AND INFLUENCE LINES FOR INDETERMINATE BEAMS**

Analysis of two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

**Learning Outcomes:**

At the end of the unit, students should able to

- Perform the calculation to analyse the two hinged and fixed arches for various loading conditions and find the maximum bending moment, radial shear and horizontal thrust.
- Know the concepts on influence lines and its application
- Understand the Muller Breslau's principle
- Analyse the beams with the redundancy is one for different end conditions

**UNIT - III**

**FLEXIBILITY MATRIX METHOD**

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the redundancy of the beams, concepts and applications of flexibility matrix method.
- Perform the analysis on the continuous beam using flexibility matrix method
- Analyse the pin jointed and rigid jointed frames using flexibility matrix method

**UNIT - IV**

**STIFFNESS MATRIX METHOD**

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two)

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the redundancy of the beams, concepts, equilibrium conditions and applications of stiffness matrix method.
- Perform the analysis on the continuous beam using stiffness matrix method
- Analyse the pin jointed and rigid jointed frames using stiffness matrix method

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**UNIT - V**

**CABLES, SUSPENSION BRIDGES AND PLASTIC ANALYSIS**

Cables and suspension bridges: Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

**Learning Outcomes:**

At the end of the unit, students should able to

- Perform the calculation to analyse the suspension cables and bridges to find out the BM and thrust.
- Know the concepts of elastic and plastic analysis and where the plastic analysis has used.
- Understand the terms of collapse load, shape factor, plastic hinges, upper and lower bound theorem, etc.
- Analyse the structure using plastic theory.

**TEXT BOOKS:**

1. Basic Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
2. Indeterminate Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
3. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.
4. Vazirani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.
5. R. Vaidyanathan & P. Perumal, Structural Analysis Vol I & II, (Fourth Edition), Laxmi Publications, New Delhi, 2016.
6. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.

**REFERENCES:**

1. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
2. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004
3. Reddy.C.S, “Basic Structural Analysis”,Tata McGraw Hill Publishing Company, 2005.
4. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd., 2011.
5. Prakash Rao D.S., Structural Analysis, Universities Press, 1996.

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# 2260146 – PRESTRESSED CONCRETE

## (Professional Elective – II)

**B.Tech. III Year II Sem** **L T P C**

**Prerequisites:** Reinforced Concrete Design **3 0 0 3**

**Course Objectives:** The objectives of the course are to

1. Understand the principles & necessity of prestressed concrete structures.
2. Know different techniques of prestressing.
3. Get the knowledge on various losses of prestress.
4. Understand Analysis and design of prestressed concrete members.

**Course Outcomes:** After the completion of the course student will be able to

1. Understand principles of prestressing.
2. Know the method and system of prestressing and evaluate losses of prestressing
3. Analysis of section for flexure and shear
4. Acquire the knowledge of evolution of process of prestressing.
5. Analysis of composite beam and deflection

**UNIT - I**

**Introduction:** Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics - Flexural analysis of prestressed concrete beam including load balancing concept.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the principles of prestressing, pretensioning and post tensioning
- Illustrate the types of prestressing
- Analysis of prestressed concrete beam

**UNIT - II**

**Methods and Systems of prestressing:** Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

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**Losses of Prestress:** Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

**Learning Outcomes:**

At the end of the unit, students should able to

- List and explain the methods of pretensioning and post tensioning
- List the causes of prestress losses in pre and post tensioned member

**UNIT - III**

**Flexure:** Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

**Shear:** General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions**.**

**Learning Outcomes:**

At the end of the unit, students should able to

- Analyse the beam members section for flexure and draw the stress diagram
- Analyse the beam members section for shear as per IS code

**UNIT - IV**

**Transfer of Prestress in Pretensioned Members:** Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

**Learning Outcomes:**

At the end of the unit, students should able to

- Understanding the force transformation in the prestressing member
- Explain the different methods to analyse the force
- Illustrate the IS provisions for stress distribution

**UNIT - V**

**Composite Beams:** Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

**Deflections:** Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

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**Learning Outcomes:**

At the end of the unit, students should able to

- Analysis of composite beams as per IS design considerations
- Analysis of short and long term deflections of composite beams as per IS code.

**TEXT BOOKS:**

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. 6th Edition, New Delhi, 2018
2. Prestressed concrete by K.U.Muthu, Azmi Ibrahim, Maganti Janardhana, M.Vijayanand, PHI Learning Pvt.Ltd, Delhi, 2016.

**REFERENCES:**

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, 3rd Edition, New York, 2010.
2. Prestressed concrete by S. Ramamrutham, Dhanpat Rai & Sons, 5th Edition, Delhi, 2013.
3. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House, 2nd Edition, 2017.
4. IS:1343-2012, Prestressed concrete – Code of practice, BIS, New Delhi.

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# 2260147 – ADVANCED STRUCTURAL DESIGN

## (Professional Elective – II)

**B.Tech. III Year II Sem** **L T P C**

**Prerequisites:** Structural Engineering I & II, Structural Analysis **3 0 0 3**

**Course Objective:** To make the student more conversant with the design principles of critical structures using limit state approach

**Course Outcomes:** At the end of the course the student will able to:

1. Enhance the capabilities to design the special structural elements as per Indian standard code of practice.
2. Design and Detailing of cantilever type of Retaining walls
3. Design of Flat slabs and Ribbed slabs and RCC Circular water tank
4. Design of Reinforced Concrete Slab Bridge decks
5. Design of steel gantry girder.

### UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counterfort Retaining walls.

**Learning Outcomes:**

At the end of the unit, students should able to

- Design of cantilever and counterfort retaining walls
- Draw the sectional details of cantilever and counterfort retaining walls

### UNIT – II

**Flat slabs:** Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears

**Ribbed slabs:** Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

**Learning Outcomes:**

At the end of the unit, students should able to

- Design of flat slabs using direct design method
- Analysis of ribbed slab
- Design of ribbed slab

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**UNIT – III**

Design of RCC Circular Water Tanks resting on ground – Flexible, Rigid and Hinged base water tanks

**Learning Outcomes:**

At the end of the unit, students should able to

- Design the circular water tank for different base conditions

**UNIT – IV**

Design of strip and raft RC foundation

**Learning Outcomes:**

At the end of the unit, students should able to

- Design the strip and raft foundation using RCC

**UNIT – V**

Introduction to Gantry Girders - Design Principles - Design of Steel Gantry Girders.

**Learning Outcomes:**

At the end of the unit, students should able to

- Design the gantry girders using steel sections

**TEXT BOOKS:**

1. Advanced RCC by N.Krishna Raju, CBS Publishers & distributors, New Delhi.
2. Advanced RCC by P.C.Varghese, PHI Publications, New Delhi.
3. Reinforced concrete design by S.Unnikrishna Pillai and Devdas Menon, 4th Edition, Tata Mc Graw Hill.
4. Design Reinforced Concrete Structures by N.Subramanian, 1st Edition, Oxford University Press, 2014.

**REFERENCES:**

1. RCC Designs by Sushil Kumar, Standard publishing house.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S.Chand Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by N.Krishna Raju, Univ. Press, New Delhi
4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi.
5. Design of Steel Structures by S.K.Duggal, 3rd Edition, Tata Mc Graw Hill, 2017.

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# 2260148 – INTRODUCTION TO FINITE ELEMENT METHODS

## (Professional Elective – II)

**B. Tech. III Year II Sem** **L T P C**

**Prerequisites:** Structural Analysis I & II **3 0 0 3**

**Course Objectives:**

1. To equip the students with the finite element analysis fundamentals.
2. To enable the students to formulate the design problems into FEA.
3. To introduce basic aspects of finite elements technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, ad solution of the resulting algebraic systems.

**Course Outcomes:** At the end of the course, the student will be able to:

1. Develop shape functions and stiffness matrices for bar and beam elements
2. Understand isoparametric formulation, static condensation etc.
3. Analyse continuous beam by stiffness matrix approach and formulate CST and LST element
4. Understand the background of mathematical equations used for development of modeling software modules to develop the various structural related applications
5. Identify mathematical model for solution of common engineering problems.

**UNIT – I**

Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand about FEM and its basic equations, concepts, advantages and disadvantages, nodes and displacement
- Explain the FEM concepts and its coordinates

**UNIT – II**

Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D & 3D – Element – shape functions upto quadratic formulation.

Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain relation

**Learning Outcomes:**


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At the end of the unit, students should able to

- Formulate the shape functions for regular and irregular 2D and 3D elements

**UNIT – III**

FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

**Learning Outcomes:**

At the end of the unit, students should able to

- Analyse the continuous beams using stiffness matrix

**UNIT – IV**

FEA Two dimensional problem – CST – LST element – shape function – stress – strain. Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element.

**Learning Outcomes:**

At the end of the unit, students should able to

- Analyse the two dimensional CST and LST elements using finite element analysis
- Analyse the isoparametric two dimensional CST elements using finite element analysis

**UNIT - V**

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

**Learning Outcomes:**

At the end of the unit, students should able to

- Analyse the mathematical model under different solution technoique.

**TEXT BOOKS:**

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

**REFERENCES:**

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook *et al.*, Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G. Ramamurty, I. K. International Publishing House Pvt. Ltd.

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# 2260102 – REMOTE SENSING AND GIS

## (Open Elective – II)

**B.Tech. III Year II Sem** **L T P C**

**Prerequisites:** Surveying **3 0 0 3**

**Course Objectives:** This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

**Course Outcomes:** At the end of the course, the student will be able to:

1. Retrieve the information content of remotely sensed data
2. Analyse the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps and apply problem specific remote sensing data for engineering applications
4. Analyse spatial and attribute data for solving spatial problems
5. Create GIS and cartographic outputs for presentation

### UNIT – I

**Introduction to Photogrammetry:** Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the photogrammetry and their terminologies
- Explain the principles and different types of photogrammetry

### UNIT – II

**Remote Sensing:** Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process.

Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the concepts of remote sensing and its advantage & disadvantage
- Explain the process of remote sensing

- Explain about electromagnetic spectrum
- Explain the satellite, sensor characteristics and elements of visual interpretation techniques

**UNIT – III**

**Geographic Information Systems:** Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the

Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters- Commonly used Map Projections - Projected coordinate Systems

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the concepts and components of GIS
- Explain the processes and operations involved in GIS
- Explain the coordinate systems of GIS

**UNIT – IV**

**Vector Data Model**: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the concepts of representation of model by vector data
- Explain their importance, features and how to create the model by analysis

**UNIT – V**

**Raster Data Model**: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

**Data Input:** Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

**Learning Outcomes:**

At the end of the unit, students should able to

- Understand the concepts of representation of model by Raser data
- Explain their importance, features and how to create the model by analysis

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**TEXT BOOKS:**

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015.

**REFERENCES:**

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.Mc Donnell, Oxford Publishers, 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

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# 2260011 – ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

**B. Tech. III Year II Sem** **L T P C**

**Pre-requisites**: Communicative English **0 0 2 1**

**1. INTRODUCTION:**

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

Gathering ideas and information to organize ideas relevantly and coherently.
Engaging in debates.
Participating in group discussions.
Facing interviews.
Writing project/research reports/technical reports.
Making oral presentations.
Writing formal letters.
Transferring information from non-verbal to verbal texts and vice-versa.
Taking part in social and professional communication.

**1. OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

Further, they would be required to communicate their ideas relevantly and coherently in writing. To prepare all the students for their placements.

**2. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language

– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

Activities onPresentation Skills – Oral presentations (individual and group) through JAM


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sessions/seminars/PPTs and written presentations through posters/projects/reports/e- mails/assignments etc.

Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**3. MINIMUM REQUIREMENT:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

Spacious room with appropriate acoustics.

Round Tables with movable chairs
Audio-visual aids
LCD Projector
Public Address system
P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
T. V, a digital stereo & Camcorder
Headphones of High quality

**4. SUGGESTED SOFTWARE:**

The software consisting of the prescribed topics elaborated above should be procured and used. Oxford Advanced Learner's Compass, 7th Edition
DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.Lingua TOEFL CBT Insider, by Dream tech
TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

**TEXT BOOKS:**

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt.Ltd. 2nd Edition.
1. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

**REFERENCES:**

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford UniversityPress, 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill, 2009.

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# 2260184 – SOIL MECHANICS LABORATORY

**B. Tech. III Year II Sem** **L T P C**

**Pre-Requisites:** Geotechnical Engineering **0 0 2 1**

**Course Objectives:** The objective of the course is

1. To obtain index and engineering properties of locally available soils, and to understand the behaviour of these soil under various loads.

**Course Outcomes:** At the end of the course the student will able to

1. Classify and evaluate the behaviour of the soils subjected to various loads.
2. Determine the atterberg limits
3. Determine the specific gravity and permeability of soil
4. Determine coefficient of consolidation
5. Apply direct and vane shear test

**LIST OF EXPERIMENTS:**

1. Grain size distribution by using sieve analysis and hydrometer analysis
2. Atterberg Limits (Liquid Limit, Plastic Limit, and Shrinkage limit)
3. a) Field density by core cutter method and
   b) Field density by sand replacement method
4. Determination of Specific gravity of soil
5. Determination of Permeability of soil by constant head test and variable head test methods
6. Standard Proctor's Compaction Test
7. Determination of Coefficient of consolidation (square root time fitting method)
8. Direct shear test
9. Tri axial compression test
10. Unconfined compression test
11. Vane shear test
12. Differential free swell index (DFSI) test

**Learning Outcomes:**

At the end of the tests, students should able to

- Perform the tests related to different soils to find their physical properties and know their limits

**REFERENCE:**

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International.

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# 2260185 – CIVIL ENGINEERING SOFTWARE LABORATORY

## B.Tech. III Year II Sem

**L T P C**

**Prerequisites:** Computer Aided Civil Engineering Drawing, Auto CAD Principles

**0 0 2 1**

Excel, Design of Reinforced Concrete Elements, Design of Steel structures

**Course Objectives:** The objectives of the course are to

1. Learn the usage of any fundamental software for design
2. Create geometries using pre-processor
3. Analyse and Interpret the results using post processor
4. Design the structural elements

**Course Outcomes:** At the end of the course, the students will be able to:

1. Model the geometry of real-world structure represent the physical model of structural element
2. Analysis & Design of determinate structures using a software
3. Analysis & Design of continuous beams and frames
4. Analysis & Design of residential building
5. Analysis & Design of Roof Trusses, water tanks and Bridges.

**LIST OF EXPERIMENTS**

1. Analysis & Design of determinate structures using a software
2. Analysis & Design of fixed beams using a software
3. Analysis & Design of continuous beams using a software
4. Analysis & Design of overhanging beams using a software
5. Analysis & Design of Plane Frames
6. Analysis & Design of Space frames
7. Analysis & Design of Residential building
8. Analysis & Design of Multistory building
9. Analysis & Design of Roof Trusses
10. Analysis & Design of water tank
11. Analysis & Design of bridge culvert
12. Analysis & Design of simple bridge

**Learning Outcomes:**

At the end of the tests, students should able to

- Analyse and design the different elements, frames and buildings and components using the software.

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# IV -I

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# 2270135 – ENVIRONMENTAL ENGINEERING

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Environmental Science **3 0 0 3**

**Course Objectives:** The objective of the course is

1. This subject provides the knowledge of water sources, water treatment, design of distribution system, waste water treatment, and safe disposal methods.
2. The topics of characteristics of waste water, sludge digestion are also included.

**Course Outcomes:** At the end of the course the student will able to

1. Assess characteristics of water and wastewater and their impacts
2. Understand layout and application of water treatment units.
3. Examine sewage and disposal of sewage.
4. Design components of water and waste water treatment plants
5. Be conversant with issues of air pollution and its control.

**UNIT – I**

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period –types of water demand – factors affecting – fluctuations – fire demand – water quality and testing –drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Asses the population forecasts methods
- Identify the drinking water standards
- Know about intakes and infiltration galleries

**UNIT – II**

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the layout of water treatment units
- Understand the different types of filters
- Design of distribution systems

**UNIT - III**

characteristics of sewage–waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers –shapes

and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing **–** ultimate disposal of sewage – sewage farming –self-purification of rivers.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Estimation of waste water and storm water
- Design of sewers
- Know about sewer appurtenances

**UNIT – IV**

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about waste water treatment plant
- Identify the primary treatment units
- Understand the working principal of septic tanks

**UNIT – V**

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates –Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the air pollution
- Know the air pollution control measures
- Understand the gaseous pollutants

**TEXT BOOKS:**

1. Environmental Engineering, I and II by SK Garg, Khanna Publications.
2. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014.
3. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
4. Environmental Engineering, I and II by BC Punmia, Std. Publications.
5. Environmental Pollution and Control Engineering CS Rao,Wiley Publications.

**REFERENCES:**

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.


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5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
6. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication.

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# 2270136 - ESTIMATION, COSTING AND PROJECT MANAGEMENT

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Concrete Technology, **3 0 0 3**

Design of Reinforced concrete elements, Design of Steel Structures

**Course Objectives:** The objective of the course is

1. To Provides process of estimations required for various work in construction.
2. To have knowledge analysis of rates on various works, contracts and Valuation.

**Course Outcomes:** At the end of the course, the students will be able to:

1. Know different types of Estimation and principles of working out quantities of works.
2. Workout detailed estimation of roads and canals and bar-bending schedule
3. Analysis of rate for different item of works in buildings
4. Understand contracts and valuation of various construction works.
5. Understand general and detailed specification of buildings.

**UNIT – I**

General items of work in Building – Standard Units. Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the different types of estimates
- Assess the detailed estimate of buildings

**UNIT – II**

Reinforcement bar bending and bar requirement schedules - Earthwork for roads and canals.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the bar bending schedule for reinforcement
- Estimate the earthwork for roads and canals

**UNIT – III**

Rate Analysis – Working out data for various items of work over head and contingent charges. Specifications – General Specifications and Detailed specifications.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Assess the rate analysis for different works
- Working out data for various items of work

**UNIT – IV**

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of building – Method of Depreciation – Examples – Method of Valuation – Examples of valuation.


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**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the types of contracts, contract documents
- Know about valuation
- Determination of depreciation and valuation of building

**UNIT - V**

Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure. Scheduling - Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks - Examples. Program Evaluation and Review Techniques - Assumptions of PERT analysis.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand about construction project planning
- Know about various planning techniques

**TEXT BOOKS:**

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie Dhanpat Rai Publisher.

**REFERENCES:**

1. Standard Schedule of rates and standard data book by public works department.
2. S.1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engg– B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006

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# 2270137 – TRANSPORTATION ENGINEERING

**B. Tech. IV Year I Sem** **L T P C**

**Pre-requisites**:- **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To understand the highway planning process and carry out surveys involved in planning and highway alignment.
2. To remember various geometric elements involved in design of highways and expressway.
3. To understand the various traffic studies and to implement traffic regulation and control measures
4. To understand the engineering properties of pavement materials used in highway construction.

**Course Outcomes:** At the end of the course the student will able to

1. Understand highway planning and development
2. Design H=highway geometric
3. Determine the traffic volume and design of traffic signals
4. Characterization of Highway material and maintenance
5. Develop Intelligent Transport System Planning and evaluation

**UNIT -I**

**HIGHWAY DEVELOPMENT AND PLANNING**

Introduction, History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- The road development plans that initiated for the development of transportation conveniences.
- The design concepts of road network Patterns.

**UNIT -II**

**HIGHWAY GEOMETRIC DESIGN**

Introduction to Highway Geometric Design; Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, Super elevation, Extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Do highway geometric design

- Know the elements of geometric design of highways
- Design of horizontal curves.
- Design of vertical curves.

**UNIT – III**
**BASIC TRAFFIC CHARACTERISTICS**

Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities–on- street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, Introduction to interchanges – Rotary Intersections.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the concepts of level of service.
- Understand IRC Methods
- Design concepts of rotary intersections.

**UNIT - IV**
**HIGHWAY MATERIALS CHERACTERIZATION**

Tests on soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- The quality requirements of highway materials like coarse and fine aggregates
- The quality analysis of bitumen.
- The construction methods of different kinds of roads and their constructional requirements.
- Methods of highway maintenance and drainage systems.

**UNIT-V INTELLIGENT TRANSPORT SYSTEMS**

ITS user services; Benefits of ITS, Public transportation operations; ITS architecture; ITS planning and evaluation- Standards and their needs; Vehicle to vehicle communications; Vehicle to infrastructure communication - Advanced vehicle control and safety system – Collision notification - Driver Status monitoring using Intelligent cruice control - User Attitude to ITS.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- The concepts of ITS.
- The planning concept of ITS
- Communications systems of ITS.


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**TEXT BOOKS:**

1. Highway Engineering – S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Nemchand & Bros., 10th edition, 2018.
2. Traffic Engineering & Transportation Planning – Dr. L. Kadyali, Khanna Publications – 6th Edition, 1997.

**REFERENCES:**

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali and Dr. N. B Lal - Khanna Publications.
3. Highway Engineering – S. P. Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)
4. IRC 37-2012 : Tentative guidelines for design of flexible pavement
5. IRC 58-2011: Guidelines for design of plain jointed rigid pavements.
6. IRC 81-1997 : Guidelines for design of overlay using Benkalman Beam Deflection Technique

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# 2270149 – GROUNDWATER HYDROLOGY

## (Professional Elective – III)

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Hydraulics and Fluid Mechanics **3 0 0 3**

**Course objectives: The objectives of the course are:**

1. To explain the concepts of Groundwater Development and Management.
2. To demonstrate and derive the basic equations used in Groundwater development and management and the corresponding equations
3. To know the investigations, field studies to conduct basic ground water studies.

**Course Outcomes:** At the end of the course, the student will be able to

1. Identify different fundamental equations and concepts as applied in the Groundwater studies
2. Analyses plumbing test data
3. To solve groundwater mathematical equations and analyze pumping tests in steady and non steady flow cases
4. Investigate surface and subsurface exploration
5. Distinguish and understand the saline water intrusion problem in costal aquifers

**UNIT - I**

**Groundwater Occurrence**

Groundwater hydrologic cycle, origin of groundwater, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. Ground Water Movement-Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about hydrologic cycle
- Understand about ground water movement
- Assess the groundwater flow

**UNIT - II**

**Analysis of Pumping Test Data-I**

Steady groundwater flow towards a well in confined and unconfined aquifers-Dupuit and Theis equations, assumptions, formation constants, yield of an open well interface and well tests.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Evaluate the steady ground water flow
- Understand about yield of an open well interface and well tests


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**UNIT - III**

**Analysis of Pumping Test Data-II**

Unsteady flow towards well-Non-Equilibrium equations, Theis solution, Jocob and Chow's Simplifications, Leak aquifers.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Evaluate the unsteady ground water flow by various methods
- Understand about leak aquifers

**UNIT - IV**

**Surface and sub-surface Investigation**

surface methods of exploration-Electrical resistivity method and Seismic refraction methods.
Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Evaluate the steady ground water flow
- Understand about yield of an open well interface and well tests

**UNIT - V**

**Saline water intrusion in aquifer**

Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the occurrence of saline water intrusion
- Understand the ground water basin management-case studies

**TEXT BOOKS:**

1. Ground water by H.M. Raghunath, Wiley Eastern Ltd.
2. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

**REFERENCES:**

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C.W. Fetta, CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

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# 2270150 – DESIGN OF HYDRAULIC STRUCTURES

## (Professional Elective – III)

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Hydraulics, Hydrology & Water Resources Engineering **3 0 0 3**

**Course Objectives:** To study various types of storage works and, diversion headwork, their components and design principles for their construction.

**Course Outcomes:** At the end of the course, the student will be able to:

1. Know types of water retaining structures for multiple purposes and its key parametersconsidered for planning and designing
2. Understand details in any Irrigation System and its requirements
3. Design of earth dam and spillway
4. Understand diversion headwork
5. Know, Analyze and Design of a irrigation system components

**UNIT - I**

Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation-Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selectionof site for a dam.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the types of reservoirs
- Estimation of capacity of reservoir
- Classify the types of dams

**UNIT - II**

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Evaluate the forces acting on a gravity dam
- Analysis of stability of gravity dam
- Know about drainage and inspection galleries

**UNIT - III**

Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins

Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the types of earth dam
- Analysis and design of earth dam
- Know about spillways and its types

**UNIT - IV**

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations-Silt Ejectors and Silt Excluders

Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the types of diversion head works
- Know the causes and failure of weirs
- Design principles of weirs on permeable foundations

**UNIT - V**

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canalescapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: types, selection of suitable type, various types, design considerations for cross drainage works

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the types of canal falls and their location
- Design principles of Notch Fall and Sarada type Fall
- Know about canal regulation works
- Understand about cross drainage works

**TEXT BOOKS:**

1. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg, Khanna Publishers.
2. Irrigation engineering by K. R. Arora Standard Publishers.
3. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., NewDelhi.

**REFERENCES:**

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta.
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

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# 2270151 – WATERSHED MANAGEMENT

## (Professional Elective – III)

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Hydrology & Water Resource Engineering **3 0 0 3**

**Course Objectives:**

1. To understand different watershed behavior
2. To be able to interpret runoff data and quantify erosion by using various modeling methods.
3. To understand land use classification and impact of land use changes on hydrological cycle parameters.

**Course Outcomes:** At the end of the course, the student will be able to

1. Understand the concept of sustainable development
2. Identify causes of soil erosion and design soil conservation measures in a watershed
3. Know the principle of water harvesting
4. Plan and design water harvesting and groundwater recharge structures
5. Plan measures for reclamation of saline soils

**UNIT - I**

**Definition and concept of Watershed:** Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the concept of watershed development in India
- Know about Integrated and multidisciplinary approach for watershed management

**UNIT - II**

**Characteristics of Watershed:** Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the characteristics of watershed
- Know about socio-economic characteristics

**UNIT - III**

**Principles of Erosion:** Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

**Learning Outcomes:**




At the end of this unit, the student will be able to

- Classify the types and effects of erosion
- Estimation of soil loss due to erosion
- Know about measures to control erosion

**UNIT - IV**

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks. Land Management: Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about water harvesting and its types
- Understand the land management

**UNIT - V**

**Ecosystem Management:** Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, silvi pasture, horticulture, social forestry and afforestation.

**Applications:** Planning of watershed management activities, people‘s participation, preparation of action plan, administrative requirements. Social aspects of watershed management, community participation, private sector participation, industrial issues, socio-economy, integrated development, water legislation and implementations, case studies, applications of geospatial techniques in watershed management systems.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about Ecosystem Management
- Understand the application of watershed management

**TEXT BOOKS:**

1. Watershed Management by JVS Murthy, New Age International publ., New Delhi, 1998.
2. Water Resources Engineering by R. Awurbs and WP James, Prentice Hall Publishers.
3. Land Water Management by VVN Murthy, Kalyani Publishers.

**REFERENCES:**

1. Irrigation and Water Management by D.K. Majumdar, Prentice Hall, New Delhi, 2000.
2. Hydrologic Modeling of Small Watersheds by C.T. Haan, H.P. Johnson, D.L. Brakensiek, ASAE, Michigan, 1982.

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# 2270152 – WATER SUPPLY NETWORK

## (Professional Elective – III)

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Hydrology & Water Resource Engineering **3 0 0 3**

**Course Objectives: The objectives of the course are**

To study water and life, sources of water, supply of water and industry water

**Course Outcomes:** At the end of the course, the student will be able to

1. Gives a broad outline of the various facets of water usage in daily life.
2. Narrates the origin of Natural waters and also to synthesize it for regular use.
3. How to conservative drinking water and how to utilize non-potable water for various other uses.
4. Explains how the water from a reservoir reaches the consumer.
5. Know the quality of water used for industry

**UNIT - I**

**Water and life**: Necessity of water – Domestic demand – Public demand – Irrigation – Transportation – Sanitation – Dilution of wastewaters – Dust palliative – Recreation – Fire protection.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about necessity of water
- Understand the water demand

**UNIT - II**

**Sources of water**: Surface sources – Ground sources – Water from atmosphere – Desalination – Recycling of waste water – Recharging of aquifers.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the sources of water
- Identify the recycling and recharging of aquifers

**UNIT - III**

**Dual supply of water**: Potable and non-potable water – Protected water – Grey water – Black water – Water borne diseases – water related diseases – Sewage Irrigation.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand about potable and non-potable water
- Know about water borne diseases

**UNIT - IV**

**Distribution of water**: Based on topography – Gravity distribution – Direct pumping – Combined




pumping and gravity flow. Service Reservoirs – Continuous supply – Intermittent supply – Networks of distribution – Hardy cross method – Emergency water supply as in case of fire accidents – Valves, hydrants and meters.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Identify the different methods of water distribution
- Know about water supply networks

**UNIT - V**

**Industries and water**: Location of Industry with reference to surface sources of water – Quality of water required for industrial operations – characteristics of waste water produced – Standards for letting industrial effluents into sources of water.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about sources and quality of water for industries
- Understand the characteristics of waste water produced

**TEXT BOOKS:**

1. Environmental Engineering by S.K. Duggal
2. Water and Waste water technology by Hammer and Hammer
3. Environmental engineering by Peery, Rowe and Tehabanaglous

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# 2270103 – DISASTER MANAGEMENT

## (Open Elective – III)

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** - **3 0 0 3**

**Course Objectives:** The subject provides different disasters, tools and methods for disaster Management.

**Course Outcomes:** At the end of the course, the student will be able to:

1. Understand Disasters, man-made Hazards and Vulnerabilities
2. Know the concepts of risk management and planning for relief
3. Assess Strengthening capacity for reducing risk
4. Develop coping strategies and plan for industrial safety
5. Formulate disaster risk reduction plan

**UNIT - I**

**Understanding Disaster:** Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)

**Hazards and Vulnerabilities:** Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand about disaster and its levels
- Know about natural and man-made hazards
- Assess the vulnerability of disaster

**UNIT - II**

**Disaster Management Mechanism:** Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the concepts of risk management and crisis managements
- Know the disaster management cycle
- Realize the disaster prevention, mitigation and preparedness

**UNIT - III**

**Capacity Building:** Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about capacity building
- Understand the disaster resources and their utility in disaster management

**UNIT - IV**

**Coping with Disaster:** Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about coping with disaster
- Understand the industrial safety plan, safety norms and survival kits

**UNIT - V**

**Planning for disaster management:** Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about disaster management planning
- Understand the disaster management act and policy in India
- Identify the preparation plans of state and district disaster management

**TEXT BOOKS:**

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015.

**REFERENCES:**

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

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## 2270186 - ENVIRONMENTAL ENGINEERING LABORATORY

**B.Tech. IV Year I Sem** **L T P C**

**Prerequisites:** Environmental Engineering **0 0 2 1**

**Course Objectives:** The objectives of the course are to

1. Perform the experiments to determine water and waste water quality
2. Understand the water &waste water sampling, their quality standards
3. Estimate quality of water, waste water, Industrial water

**Course outcomes:** At the end of the course, the students will be able to:

1. Understand about the equipment used to conduct the test procedures
2. Determination of pH, Electrical Conductivity, Acidity and Alkalinity
3. Examine and Estimate water, waste water, air and soil Quality
4. Compare the water, air quality standards with prescribed standards set by the local governments
5. Develop a report on the quality aspect of the environment

**List of Experiments**

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/DO
12. Determination of Residual Chlorine

**REFERENCES:**

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson / Brooks/ Cole; Second Edition2008.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York1985.
4. Met Calf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw- Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil,1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

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# 2270187 - TRANSPORTATION ENGINEERING LABORATORY

**B. Tech. IV Year I Sem** **L T P C**

**Pre-requisites**: Transportation Engineering **0 0 2 1**

**Course Objectives:** The objective of the course is

1. To gain the practical knowledge of properties of Highway materials
2. To gain the practical knowledge of traffic surveys.
3. To gain the practical knowledge of Bitumen mix designs.

**Course Outcomes:** At the end of the course the student will able to

1. Determine crushing, abrasion and impact value of Highway materials
2. Determine specific gravity and water absorption of Highway materials
3. Determine Flakiness and elongation Indices of coarse Aggregates
4. Identify ductility and softening point value of bitumen
5. Determination of Traffic Volume and parking studies

**Note: In the following list of 15 experiments the student has to complete minimum of 12 experiments**

**List of Experiments:**

**SECTION I: ROAD AGGREGATES**

1. Determination of Aggregate Crushing value.
2. Determination of Aggregate Impact Test.
3. Determination of Specific Gravity and Water Absorption.
4. Determination of Abrasion value of aggregate.
5. Determination of Flakiness and elongation Indices of coarse Aggregates.
6. Determination of Attrition value of aggregate.

**SECTION II: BITUMINOUS MATERIALS**

7. Determination of Penetration Value.
8. Determination of Ductility value of bitumen.
9. Determination of Softening Point value.
10. Determination of Marshal Stability value
11. Determination of Flash and fire point temperature.

**SECTION III: TRAFFIC STUDIES**

12. Determination of Traffic Volume Counts-Mid Blocks
13. Determination of Traffic Volume Counts-Junctions
14. Determination of Spot speed study.
15. Determination of Parking Studies

**TEXT BOOKS:**

1. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay Highway Material Testing by Khanna S.K., Justo C.E.G, Nem Chand & Bros.
2. Principles and practice of Highway Engineering, L.R Kadiyali & N.B.Lal, Khanna, 2007.
3. Traffic Engineering and Transportation planning, L.R Kadiyali, Khanna publications, 2007.

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# IV-II

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# 2280153 – RAILWAY, AIRPORT AND HARBOUR ENGINEERING

## (Professional Elective – IV)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Transportation Engineering **3 0 0 3**

**Course Objectives:** the objectives of the course are to

1. Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
2. Introduce component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail.
3. Explain the classes of harbors, features, planning and design of port facilities.

**Course Outcomes:** At the end of this course, the students will be able to:

1. Design runways and taxiways.
2. Design the infrastructure for large and small airports
3. Design various crossings, signals railway track in Railway Projects.
4. Understand track maintenance and operation
5. Plan the harbors and ports projects including the infrastructure required for new ports and harbors.

**UNIT – I**

**Airport Engineering:** Introduction to Air Transportation - Aircraft Characteristics – Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about air transportation and its characteristics
- Calculate runway length
- Plot wind rose diagram

**UNIT - II**

**Introduction to Railways:** Role of Indian Railways in national development – Railways for Urban Transportation – LRT, Mono Rail, Metro Rail & MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast, Subgrade and Embankments, Ballast less Tracks.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about Indian railways and its development
- Understand about Permanent Way, Components and their Functions
- Classify the types of rails


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**UNIT – III**

**Geometric Design of Railway Track:** Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about geometric design of railway track
- Understand about gradients and grade compensation
- Classify the types of curves

**UNIT – IV**

**Track maintenance and Operation:** Points and Crossings - Turnouts, Stations and Yards – Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about points and crossings
- Analyze signaling and interlocking
- Explain track circuiting and maintenance

**UNIT – V**

**Dock & Harbour Engineering:** Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about ports and harbours
- Understand the requirements for ports and harbours and explain the navigational aids

**TEXT BOOKS:**

1. Venkataramaiah C (2016), “Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels”, Universities Press (India) Private Limited, Hyderabad.
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017.

**REFERENCES:**

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportaion Engineering by R. Srinivasa Kumar, University Press India

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# 2280154 – BRIDGE ENGINEERING

## (Professional Elective – IV)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Structural Engineering, Soil Mechanics, Foundation Engineering, and Water Resources Engineering **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To study different types of bridges, forces that act on bridges, Design of different types of Bridges

**Course Outcomes:** At the end of the course, the students will be able to:

1. Understand classification of bridges and Design standards and specifications
2. Design of Slab culvert and T beam bridges.
3. Design of steel bridges
4. Design of Pier, abutment and Bridge bearings.
5. Design of bridge foundations.

**UNIT- I**

**Introduction:** Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.

**Standard Specifications for Roads and Railways Bridges:** General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of road and railway bridges, detailed explanation of IRC standard live loads.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify bridges
- Understand the standard specifications for roads and railway bridges

**UNIT- II**

**Design Consideration for R. C. C. Bridges:** Various types of R.C.C. bridges (brief description of each type), design of R.C.C. solid slab and T-beam bridges.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyze the RCC bridges
- Design of R.C.C. solid slab and T-beam bridges

**UNIT- III**

**Design Consideration for Steel Bridges:** Various types of steel bridges (brief description of each), design of plate girder bridge.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyze the steel bridges
- Design of plate girder bridge


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**UNIT- IV**

Design loads for Piers and abutments - Brief description about approaches, bearings, joints, articulation and other details.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyze the loads for piers and abutments
- Explain about approaches, bearings, joints, articulation

**UNIT - V**

**Bridge Foundation:** Various types, necessary investigations and design criteria of well foundation. Design of well foundation.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyze the various types of bridge foundation
- Design of well foundation

**REFERENCES:**

1. Essentials of Bridge Engineering, D. J. Victor, Oxford & IBH Pub, New Delhi.
2. Design of Bridges, N. Krishna Raju, Oxford & IBH, New Delhi.
3. Bridge Deck Analysis, R. P. Pama & A. R. Cusens, John Wiley & Sons.
4. Design of Bridge Structures, T. R. Jagadish & M.A.Jairam, Prentice Hall of India, New Delhi.
5. IRC:112-2011, Code of practice for concrete road bridges
6. IRC:5-1998, Standard specification and code of practice for road bridges (General features of Design)
6. IRC:6-2017, Standard specification and code of practice for road bridges (Loads & Load Combinations)

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## 2280155 – TRAFFIC ENGINEERING

## (Professional Elective – IV)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Transportation Engineering **3 0 0 3**

**Course Objectives:** To provide engineering techniques to achieve the safe and efficient movement of people and goods on roadways.

**Course Outcomes:** At the end of the course, the student will be able to:

1. Understand basics principles of Traffic Engineering
2. Analyze parking data and model accidents
3. Determine capacity and LOS.
4. Design signal and signal coordination
5. Develop transportation system management.

**UNIT - I**

Traffic Studies (Part- I): Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the traffic studies
- Classify speeds studies
- Explain about delay studies

**UNIT - II**

Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling; Road Safety Auditing, Measures to increase Road safety.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the parking studies
- Know about accident studies
- Explain about road safety

**UNIT - III**

Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, With or without access




control, Basic freeway segments - Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the capacity and LOS Analysis
- Analyze the traffic capacity
- Explain the service flow rate and adjustment

**UNIT - IV**

Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal setting for Fixed Time signals, Warrants for Signals, Time Plan Design for Pre-Timed Control- Lane group analysis, Saturation flow rate and Adjustment factors, Uniform and Incremental Delay, Vehicle Actuated Signals, Signal Coordination.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Design signals
- Classify signels
- Explain about signal coordination

**UNIT - V**

Transportation System Management - Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about transportation system management
- Understand the parking management
- Explain the strategies for working hours

**TEXT BOOKS:**

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication
3. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.

**REFERENCES:**

1. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.
2. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas, Prentice Hall, 1977.
3. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication
4. Fundamentals of Traffic Engineering – McShane & Rogers.
5. Highway Capacity Manual -2000.

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# 2280156 – PAVEMENT ANALYSIS AND DESIGN

## (Professional Elective – IV)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Transportation Engineering **3 0 0 3**

**Course Objectives:** The study factors affecting pavement design, material characteristics, design of flexible, rigid pavements and low volume roads.

**Course Outcomes:** At the end of the course, the student will be able to:

1. Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes
2. Analyze flexible and rigid pavements
3. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods
4. Design a rigid pavement using IRC, and AASHTO methods
5. Design of pavement for low volume roads.

**UNIT - I**

**Factors Affecting Pavement Design**: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify pavements
- Know the axle types
- Understand the traffic analysis

**UNIT - II**

**Stresses In Pavements**: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses in Flexible Pavements**: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts. **Stresses in Rigid Pavements**: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the Vehicle-Pavement Interaction
- Explain the stresses in flexible and rigid pavements

**UNIT - III**

**Material Characteristics:** CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and




Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the material characteristics for pavement
- Explain about permanent deformation parameters and other properties

**UNIT - IV**

**Design of Flexible Pavements**: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods

**Design of Rigid Pavements:** Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, and Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Design the flexible pavements as per HMA and other Base Combinations, AASHTO, IRC Methods
- Design of rigid pavements as per PCA, AASHTO & IRC Specifications

**UNIT - V**

**Design of Pavement for Low Volume Roads:** Pavement design for low volume roads, rural road designs – code of practice. **Design of Overlays**: Types of Overlays, Suitability, Design of overlays.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Design of pavement for low volume roads
- Design of overlays

**TEXT BOOKS:**

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

**REFERENCES:**

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications.
2. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc.
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design.

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(AUTONOMOUS)

# 2280157 – HYDROLOGY & WATER RESOURCES ENGINEERING

## (Professional Elective – V)

**B. Tech. IV Year II Sem** **L T P C**

**Pre-requisites**: Fluid Mechanics & Hydraulics and Hydraulic Machinery **3 0 0 3**

**Course objectives:** The objective of the course is

1. To study occurrence movement and distribution of water
2. To know the estimation of hydrologic parameters like evaporation, infiltration
3. To understand the concept of unit hydrograph
4. To know the basic principles and movement of groundwater
5. To impart the knowledge of various irrigation techniques , requirements of the crops,
6. To learn about design of irrigation canals which are associated with sediment problem

**Course Outcomes:** At the end of the course the student will able to

At the end of the course, the student will be able

1. Understand various components of hydrologic cycle
2. Evaluate various runoff measurements technique
3. Apply the concepts of movement of groundwater beneath the earth
4. Apply the knowledge of various irrigation techniques
5. Use components of designing unlined and lined irrigation canals.

**UNIT - I**

**HYDROLOGY**

Hydrologic cycle, types and forms of precipitation, rainfall measurement, computation of average rainfall over a basin, Adjustment of record, Rainfall Double Mass Curve. Evaporation, factors affecting evaporation, measurement of evaporation- Evapotranspiration estimation Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understanding of hydrology and its application in varied areas of civil engineering
- Illustrate the methods measuring rainfall
- Interpret the rainfall over a drainage basin
- Explain the need of measuring the abstractions
- Assess the losses from rainfall

**UNIT - II**

**HYDROGRAPHS**

Distribution of Runoff - Factors affecting Runoff - Rational Formulae.

Hydrograph Analysis Flood Hydrography - Effective Rainfall - Base Flow - Base Flow Separation - Direct Runoff Hydrograph - Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.




**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the runoff cycle
- Interpret the discharge over a basin using hydrographs
- Explain the concept of s-hydrograph
- Assess the runoff from ungauged basin using synthetic unit hydrograph
- Apply the unit hydrograph theory in flood estimation

**UNIT - III**
**GROUNDWATER**

Groundwater Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivitty and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of well's, Well Construction - Well Development.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the movement of groundwater
- Explain the groundwater properties that cause flow
- Assess the groundwater properties
- Interpret the flow of water through different subsurface layers
- Understand the well construction and development techniques

**UNIT - IV**
**IRRIGATION**

Necessity and Importance of Irrigation, ill effects of irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility - Crop Roation, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, Duty and delta, factors affecting duty- Depth and frequency of Irrigation, irrigation requirements and efficiencies-Water Logging.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the need of irrigation in India
- Illustrate different methods of irrigation
- Establish the relation between soil-water-plant
- Assess the duty and delta for crop
- Design the required discharge for crop

**UNIT - V CANALS**

Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standard for a canal design, canal lining.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify the irrigation canals
- Understand the importance of silt in canal design
- Design the irrigation canals using silt concept




- Illustrate the lining materials
- Apply the silt theories in canal design

**TEXT BOOKS:**

1. Engineering hydrology by Jayram Reddy, Laxmi publications pvt. Ltd., New Delhi.
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi.

**REFERENCES:**

1. Elementary hydrology by V. P. Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House.
3. Water Resources Engineering - I by Dr. G. Venkata Ramana, Acadamic Publishing Company.
4. Irrigation Water Management by D. K. Manjundar, Printice Hall of India.
5. Irrigation and Hydraulic structures by S. K. Grag.
6. Applied hydrology by Ven Te Chow, David R. Maidment larry W. Mays Tata Mc. Graw Hill.
7. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI.

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# 2280158 - INDUSTRIAL WASTE WATER TREATMENT

## (Professional Elective – V)

**B. Tech. IV Year II Sem** **L T P C**

**Pre-Requisites:** Environmental Engineering **3 0 0 3**

**Course Objectives:** The objective of the course is

1. To enrich the knowledge on sources and characteristics of industrial wastewater.
2. To discuss the different methods of waste water treatment such as de-nitrification, membrane separation, air stripping, etc.
3. To understand the characteristics and composition of wastewater generated from industrial processes.
4. To design and operate effluent treatment plants for joint treatment of raw industrial wastewater and domestic sewerage.

**Course Outcomes:** At the end of the course the student will able to

1. Distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. Understand the industrial process, water utilization and waste water generation.
3. Acquire the knowledge on operational problems of common effluent treatment plants.
4. Impart knowledge on selection of treatment methods for industrial wastewater.
5. Understand the characteristics and composition of different Industries

**UNIT – I**

Sources of Pollution – Physical, Chemical, Organic and Biological properties of Industrial Wastes – Differences between industrial and municipal waste waters – Effects of industrial effluents on sewers and Natural Water Bodies.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the physical, chemical, organic and biological properties of Industrial wastes
- Distinguish between industrial and municipal waste waters

**UNIT – II**

Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by Floatation – Waste Reduction - Volume Reduction – Strength Reduction.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the Pre and Primary Treatment
- Understand the treatment methods of industrial waste water

**UNIT – III**

Waste Treatment Methods – Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane Separation Process – Air Stripping and Absorption Processes – Special Treatment Methods – Disposal of Treated Waste Water.

**Learning Outcomes:**




At the end of this unit, the student will be able to

- Explain the waste treatment methods
- Know the disposal methods of treated waste water

**UNIT – IV**

Characteristics and Composition of waste water and Manufacturing Processes of Industries like Sugar, Characteristics and Composition of Industries like Food Processing Industries, Steel, Petroleum Refineries.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the characteristics and composition of waste water
- Explain the characteristics and composition of Food Processing Industries, Steel, Petroleum Refineries.

**UNIT – V**

Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries - Joint Treatment of Raw Industrial waste water and Domestic Sewage – Common Effluent Treatment Plants (CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the characteristics and composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries
- Know the common effluent treatment plants
- Understand the economical aspects

**TEXT BOOKS**

1. Industrial Waste Water Pollution Control by W. Wesley Eckenfelder – McGraw-Hill.
2. Waste Water Treatment by M.N.Rao & A.K.Datta, Oxford & Ibh publisher.

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# 2280159 - WASTE MANAGEMENT

## (Professional Elective – V)

**B. Tech. IV Year II Sem** **L T P C**

**Pre-Requisites:** Environmental Engineering **3 0 0 3**

**Course Objectives**: The objective of the course is

1. To study about waste water treatment methods

**Course Outcomes**: At the end of the course the student will able to

1. Identify the physical and chemical composition of wastes
2. Analyze the functional elements for solid and liquid waste management.
3. Understand the effluent treatment Plants and its disposal
4. Know the Industrial wastes treatment methods
5. Acquired knowledge in effluent disposal methods.

**UNIT – I**

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyze the quality requirements of boiler, cooling waters, Textiles, Food processing and Brewery Industries
- Explain the Boiler and Cooling water treatment methods

**UNIT – II**

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans and problems.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the basic theories of Industrial waste water Management
- Explain the joint treatment of industrial wastes and domestic sewage

**UNIT – III**

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the recirculation of industrial wastes




- Explain the Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries

**UNIT - IV**

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects, and treatment methods.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the manufacturing process and design origin of liquid waste from different industries
- Assess the effects and treatment methods

**UNIT – V**

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the common effluent treatment plants
- Assess the effluent disposal methods

**TEXT BOOKS:**

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

**REFERENCES:**

1. Solid Waste Engineering by WA. Worrell, P.A Vesilind Cengage Learning, 2012.
2. Solid and Hazardous waste Management M.N Rao and R. Sulthana. B.S Publications, 2012.
3. Liquid waste of Industry by Nemerow Addison- Wesely Educational Publisher.

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# 2280160 - ENVIRONMENTAL IMPACT ASSESSMENT

## (Professional Elective – V)

**B. Tech. IV Year II Sem** **L T P C**

**Pre-Requisites:** Environmental Engineering **3 0 0 3**

**Course Objectives**: The objective of the course is

1. To understand the aspects of Environment Impact Assessment methodologies
2. To analyze the impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.
3. To learn the different Act's related to Environment

**Course Outcomes**: At the end of the course the student will able to

1. Identify the environmental attributes to be considered for the EIA study.
2. Assessment of impact of development activities on vegetation and wildlife
3. Procure soil quality and prediction of impact.
4. Identify the suitable methodology and prepare rapid EIA.
5. Know the environmental protection act.

**UNIT – I**

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the basic concept of EIA
- Explain the EIA methodologies

**UNIT- II**

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Assess the impact of development activities on Vegetation and wildlife
- Explain the causes and effects of deforestation

**UNIT- III**

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Assess the soil quality, impact significance
- Know the mitigation measures


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**UNIT – IV**

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the Environmental Audit & Environmental legislation
- Classify environmental Audit
- Evaluation of Audit data and preparation of Audit report

**UNIT - V**

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the different Act's related with Environmental
- Analyze the case studies and preparation of Environmental Impact assessment statement

**TEXT BOOKS:**

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

**REFERENCES:**

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers Rutledge, London, 1992.

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# 2280161 – FOUNDATION ENGINEERING

## (Professional Elective – VI)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Reinforced Concrete Design **3 0 0 3**

**Course Objectives:**

1. To Plan Soil exploration programme for civil Engineering Projects
2. To check the stability of slopes
3. To determine the lateral earth pressures and design retaining walls
4. To determine the Bearing capacity of Soil
5. To design pile group foundation

**Course Outcomes:** At the end of the course the student will able to

1. Understand the principles and methods of Geotechnical Exploration
2. Stability analysis by various methods
3. Understand earth pressure theories and stability analysis of retaining wall
4. Analyse and design of shallow foundations
5. Analyse and design of deep foundations

**UNIT – I**

**SOIL EXPLORATION**: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the site investigation and sampling methods
- Prepare the bore log report and site investigation report
- Know the procedure for Plate load test

**UNIT – II**

**SLOPE STABILITY**: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's Stability Number- stability of slopes of earth dams under different conditions.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the different types of failure
- Analyze the different slope stability methods
- Analyze the stability of earth dams


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**UNIT – III**

**EARTH PRESSURE THEORIES**: Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.

**RETAINING WALLS**: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the earth pressure theories
- Know the different types of retaining wall
- Analyze the stability of gravity and cantilever retaining walls

**UNIT – IV**

**SHALLOW FOUNDATIONS** - Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the types and choice of foundation
- Analyze the safe bearing capacity of soil using Terzaghi's, and IS code methods
- Know the allowable settlements of structures

**UNIT - V**

**PILE FOUNDATION**: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the types of piles
- Analyze the load carrying capacity of piles based on static pile formulae, dynamic pile formulae
- Know the settlement of pile groups

**TEXT BOOKS:**

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt.Ltd, New Delhi.
2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.

**REFERENCES:**

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt.Ltd. (1998).
4. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, Newyork.

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# 2280162 – GROUND IMPROVEMENT TECHNIQUES

## (Professional Elective – VI)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Geo-Technical Engineering, Foundation Engineering **3 0 0 3**

**Course Objectives:**

1. To know the need of ground improvement
2. To acquire the knowledge on the various ground improvement techniques available and their applications for different types of soils
3. To understand suitable ground improvement technique for given soil conditions.

**Course Outcomes:** At the end of the course the students will be able to

1. Identify soil type and Know the necessity of ground improvement
2. Understand shallow and deep compaction techniques
3. Design of dewatering system
4. Apply physical and chemical modification
5. Select & design suitable ground improvement technique for existing soil conditions in the field

**UNIT - I**

**Introduction to Engineering Ground Modification**: Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Identify the soil types
- Analyze the soil characterize by different methods

**UNIT - II**

**Mechanical Modification**: Shallow Compaction Techniques- Deep Compaction Techniques- Blasting-Vibrocompaction- Dynamic Tamping and Compaction piles.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the different shallow compaction techniques
- Understand the different deep compaction techniques

**UNIT - III**

**Hydraulic Modification**: Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering-Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains,

**Learning Outcomes:**

At the end of this unit, the student will be able to


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**UNIT - IV**

**Physical and Chemical Modification** – Modification by admixtures, Modification Grouting, Introduction to Thermal Modification including freezing.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know the physical and chemical modification of soil
- Understand the thermal modification method

**UNIT – V**

**Modification by Inclusions and Confinement** - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the soil reinforcement methods
- Understand the In-situ ground reinforcement

**TEXT BOOKS:**

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill Publications.
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis

**REFERENCES:**

1. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
4. K. Krisch & F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

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# 2280163 – REPAIR AND REHABILITATION OF STRUCTURES

## (Professional Elective – VI)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites: -** **3 0 0 3**

**Course Objectives:**

To understand the various concepts of rehabilitation and retrofitting of structures

**Course Outcomes:** At the end of the course, Students will be able to:

1. Develop various maintenance and repair strategies.
2. Understand corrosion of steel its causes and prevention
3. Assess damages by Non Destructive Testing
4. Understand the common types of repair and method of retrofitting
5. Understand and use the different techniques for structural retrofitting and health monitoring of structures

**UNIT – I**

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the deterioration and distress in structures
- Analyze the causes and prevention of deterioration
- Classify damages

**UNIT – II**

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Analyze the causes and mechanism of steel reinforcement corrosion
- Understand the damage of structures due to fire

**UNIT – III**

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Identify the inspection and testing of distress
- Assess the damage by NDT techniques

**UNIT – IV**

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting & Shotcrete – Underpinning.

Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.


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**Learning Outcomes:**

At the end of this unit, the student will be able to

- Identify the common types of repairs
- Assess the different strengthening of structures

**UNIT – V**

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the health monitoring of structures
- Know the building instrumentation

**TEXT BOOKS:**

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa kumar, Oxford University press

**REFERENCES:**

1. Defects and Deterioration in Buildings, EF & N Spon, London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
4. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A.Richardson, (1991).

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# 2280164 – REMOTE SENSING AND GIS

## (Professional Elective – VI)

**B.Tech. IV Year II Sem** **L T P C**

**Prerequisites:** Surveying **3 0 0 3**

**Course Objectives:** This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

**Course Outcomes:** At the end of the course, the students will be able to:

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems

**UNIT – I**

**Introduction to Photogrammetry:** Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the Principles & types of aerial photograph
- Recognize the fundamentals of stereoscopy

**UNIT – II**

**Remote Sensing:** Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process.

Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the basic concept of remote sensing
- Know the Indian Satellites and Sensors characteristics
- Identify the digital data, elements of visual interpretation techniques

**UNIT – III**

**Geographic Information Systems:** Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map




projection parameters- Commonly used Map Projections - Projected coordinate Systems

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about GIS and components of a GIS
- Analyze the data
- Understand about Geographic Coordinate System

**UNIT – IV**

**Vector Data Model**: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about Topology and its importance
- Understand the data models

**UNIT – V**

**Raster Data Model**: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

**Data Input:** Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Know about raster data model
- Realize the data input methods

**TEXT BOOKS:**

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

**REFERENCES:**

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.Mc Donnell, Oxford Publishers, 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.